

BRITISH COLUMBIA DEPARTMENT OF LANDS

FOREST SERVICE

HON. WILLIAM R. ROSS, K.C., Minister of Lands

British Columbia Timber for Prairie Farms

DAIRY BARNs, ICE AND MILK HOUSES

FARM BUILDINGS SERIES

BULLETIN No. 2



THE GOVERNMENT OF
THE PROVINCE OF BRITISH COLUMBIA.

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1915.

BRITISH COLUMBIA

LUMBER, SHINGLES

and other products of

Douglas Fir

Western Larch

Mountain Western Pine

Western Red Cedar

Western Hemlock

Spruce

Western White Pine



British Columbia Timber for Prairie Farms.

DAIRY BARNS, ICE AND MILK HOUSES.

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The
**LUMBERING INDUSTRY OF BRITISH
COLUMBIA.**

TO THE PRAIRIE FARMER.

In the forests of British Columbia there stands to-day more than half Canada's supply of commercial timber. Forest surveys made during recent years throughout the Province show 30,000,000 acres of timber ready for the market, and 45,000,000 acres of younger growth that will reach commercial size during the present century. The present merchantable stand is estimated at 400,000,000,000 feet board measure.

Taught by the experience of older countries, British Columbia has adopted a vigorous conservation policy and is carefully protecting her vast forest areas from fire and misuse.

The manufacture of lumber and other wood products is the most important industry of this forest Province. Each year 1,500,000,000 feet of timber is cut to supply the sawmills, pulp and paper mills, and other wood-using factories west of the Canadian Rockies. But the forests produce more wood each year than the mills can find markets for, and so much timber goes to waste. The most of the timber is public property; the prosperity of the Province depends very largely upon the lumbering industry; and it is therefore the duty of the Government to help secure the widest possible market for British Columbia lumber both in foreign countries and in Canada.

The main market for Western lumber to-day is in the Prairie Provinces of Canada. Each farm is, after all, a factory for agricultural produce and needs a well-built plant like any other factory. This means good buildings—a comfortable, convenient house, good barns, granaries, silos, fences, and shelter for machinery. The best material for this is wood. It is cheap, handy to use, warm, sanitary, and it lasts. British Columbia therefore desires to give the citizens of Alberta, Saskatchewan, and Manitoba full information concerning her forest products, asking them to bear in mind that these products are "grown and manufactured in Canada," and that trade between the

Provinces of the Canadian West is the surest foundation for our common prosperity.

The Bulletins.

Valuable bulletins on farm buildings are now being issued by agricultural authorities all over Canada and the United States. The College of Agriculture of the University of Saskatchewan was engaged in this most useful work; the Government of British Columbia entered into a co-operative agreement with the University, and the series of farm bulletins listed on page 65 of this booklet is the result. The agricultural information contained herein and the plans and bills of material were prepared under the immediate supervision of Mr. W. J. Rutherford, Dean of the College of Agriculture, and thus give up-to-date and authoritative views on the agricultural subjects dealt with. The information concerning lumber is supplied by the Forest Service of the Government of British Columbia.

In the building plans, five things are aimed at in particular:—

- (1.) That they should be specially designed to meet Prairie conditions.
- (2.) That they should be simple and practical to meet the needs of the average farmer.
- (3.) That ordinary stock sizes of lumber should be used throughout in order to keep the cost low.
- (4.) That it should be easy for the farmer to make additions to the buildings whenever more accommodation should be needed.
- (5.) That the details of the plans should be readily alterable to suit individual needs.

The plans printed in these bulletins show enough detail for them to be used as working plans. Any one wishing to obtain large-scale working plans can secure them at cost by writing to the **Chief Forester, Victoria, B.C.** A reference list of bulletins and of sources of agricultural information will be found on page 66.

Note.

While it is understood that the agricultural authorities in Alberta and Manitoba have already published pamphlets on farm buildings, and contemplate issuing others, it is believed that all Prairie farmers will be interested in the British Columbia bulletins, and editions for general distribution on the Prairies have accordingly been printed.

UNIVERSITY OF SASKATCHEWAN,
COLLEGE OF AGRICULTURE,
WALTER C. MURRAY, *President.* W. J. RUTHERFORD, *Dean.*

Dairy Barns, Ice and Milk Houses for Prairie Farms.

BY A. R. GREIG, PROFESSOR OF AGRICULTURAL ENGINEERING, AND A. M.
SHAW, PROFESSOR OF ANIMAL HUSBANDRY.

DAIRY BARNS.

Dairy-farming in Western Canada.



THE advent of Government and co-operative creameries in the Central West, together with co-operative methods of marketing, have given an impetus to the dairy industry which augurs well for its future. In the past very large quantities of butter have been imported into the Western Provinces for home consumption. There seems no reason why this should continue, as it has been successfully demonstrated that a No. 1 quality of butter can be manufactured here at a cost that will enable the Prairie farmer to compete with any country in the world.

Many farmers are now turning their attention to this line of work. Some of them have had previous experience and understand the business. Many, however, are unfamiliar with it and are simply beginners. In either case the man engaging in dairying must remember that he is embarking in a specialized line of work, which requires more careful attention than ordinary farming operations. If, however, he has a liking for the work, is willing to grade up his herd to a dairy quality, to grow the necessary feed to keep up the milk-supply during the entire season, to provide the necessary shelter in the form of suitable buildings, and to care for his milk and cream properly, there is no reason why he cannot make a success of the business.

Western Canada produces suitable feeds in abundance for dairy cows. Great quantities of the very best of roughage, in the form of oat and pea hay and green oat-sheaves, can be easily grown. The coarse grains, such as barley and oats, are also in most years abundant and cheap. In many parts fodder-corn can be grown successfully, and where a silo is used in which to store it, no better or cheaper food for dairy cows can be found. Roots grow well and yield heavily. Tame grasses such as brome, western rye, and timothy, together with alfalfa, are also suited to our conditions. Good water is found in most districts in abundance.

The lands upon which these cows are pastured and upon which these feeds are grown are as yet comparatively low in price. The dairy products are comparatively high. Where such a combination exists we have nearly ideal conditions for successful dairying.

Unlike the wheat-farmer, the dairyman's work is evenly distributed throughout the entire year. He can keep his hired help by the year, which is by far the most satisfactory method. Not only is this true, but his income is also steady. He receives cash in the form of weekly or monthly cheques for his products. A frost or a hail-storm does not cut it off abruptly or spoil his season's work, as is the case where one crop is depended on entirely.

Planning a Dairy Barn.

Many mistakes can easily be made in building a dairy-barn, and frequently they are not discovered until it is too late to correct them. Bad interior arrangements may cause a great many unnecessary steps and add very greatly to the work of caring for the animals. Mistakes may be made in the location of the silo, in the placing and width of the doors, in the length of platforms, width of gutters, feed and litter alleys. All these details should be carefully considered beforehand.

Costliness is not a prime requisite of the dairy-barn. Its cost should be in keeping with the size and revenue-producing power of the farm. Money invested in a dairy-barn should pay at least 10 per cent. per year to take care of the depreciation, taxes, and insurance. Many barns pay a great deal more. If \$1,800 is invested in a dairy-barn to house thirty cows, with a loft to hold sufficient roughage for their winter feed, \$180 per year would have to be charged up as rental for the barn. This would amount to \$6 per cow per year. Sometimes too little money is spent in barns, and the result in that case is usually

a great increase in labour. Work has to be done at a disadvantage and it may be impossible to keep such buildings sanitary and comfortable.

Following are some of the main points to be kept in mind in building and equipping a dairy-barn. As far as possible, all of them have been embodied in the plans shown in this bulletin.

Site.—High, well-drained land should be chosen as a site for a dairy-barn, and it is important that the barnyard be well graded so as to slope away from the buildings. Where this is overlooked a very muddy barnyard is the result.

Size and Shape.—The width and length of dairy-barns must vary with conditions, but 30 feet is as narrow as should be used where two rows of cows are to be stabled. If a narrower barn is used there will not be sufficient space left in front and behind the cows for feed and litter alleys. A width of 34 or 36 feet has been proved by experience to give the best results in comfort, convenience, and economy of construction for two rows of cows either facing inwards or outwards.

Very large dairy-barns are not as a rule either practical or satisfactory. They need be only large enough to meet present requirements, but should be constructed in such a manner that additions may be added from time to time as required. It is expensive to tear down a barn in order to build a larger one. Most of the barns herein described are so planned that enlargement requires only lengthening and entails a minimum of expense.

The appearance of a barn is also worth considering. The barn that is well proportioned adds greatly to the appearance of the farmstead. The front part, next to the driveway especially, should be neat and tidy. Some farmers have the name of the farm as well as their own painted on the barn. This adds interest to the place and has a certain amount of advertising value.

Arrangement of Cows.—The cows may stand either facing in or out. Some prefer one way and some the other. If the cows face the walls there will be a manure-alley in the middle and a feed-alley at each side. If desired, the manure-alley may be made wide enough to allow a team to be driven through; in which case the barn would need to be 36 feet wide.

If the cows face each other there will be one feed-alley only and two manure-alleys. This arrangement will probably suit the majority of dairymen because of the greater ease in feeding. The manure of

course must be removed in a litter-carrier, a wheelbarrow, or perhaps with a stone-boat and a single horse. Where a silo is used a central feed-alley is very convenient; a truck can be wheeled down it and all the animals fed at once.

Sanitation and Comfort.—The stable should be built so that it can easily be cleaned not only of manure, but also of dust and litter. No broad window-ledges should be left to collect dust, and the floors should be tight and smooth to admit of thorough cleansing. Plenty of light should be provided for, as there is no better disinfectant than sunshine, and it is necessary for the health and general welfare of the animals. The cows should be made as comfortable as possible. They should receive the first consideration—not the herdsman. Comfort and convenience for both is desirable, but the cow comes first in planning a dairy-barn.

Convenience in Feeding.—A considerable part of the cows' feed consists of roughage in the form of hay and straw, oat-sheaves, and silage. If this bulky food is not conveniently located, it requires a very large amount of unnecessary work to handle it, and as labour is as a rule expensive, the necessity for care in this respect is obvious. In a barn with long feed-alleys a truck of some kind can be used to advantage. As a rule the storage of roughage in a loft overhead is to be recommended, so arranged that it may be put down through chutes to the feed-alleys in front of the cows. The location of the silo is also important. If possible, it should be placed close enough to the feed-room of the barn so that only a single handling of the silage is necessary.

Feed-room.—The feed-room should not be too small and should be conveniently placed so as to connect directly with one or more of the feed-alleys; also with the silo if one is used, and with the root-cellars if possible. A stairway leading from it to the loft is much handier than an upright ladder on the wall of the barn. Feed-bins or chop-boxes of generous capacity should be built in the feed-room. It is convenient to fill them by chutes from large bins located in the loft overhead, but as this arrangement entails a good deal of labour in raising all the chop to the second floor, it is not always practical or expedient.

Convenience in handling Manure.—Cleanliness is of prime importance in the dairy business, and it is necessary that all manure be

removed at least once each day. Faulty construction in this respect may make it very difficult to keep the cows clean and entail a large amount of hand-labour. A litter-carrier will meet all requirements, or a wide driveway may be provided which will permit of driving a horse and boat or a team and wagon through the barn. In small and medium-sized barns removal of the manure twice a day by a wheelbarrow will be found as good a method as any.

Convenience in handling Milk.—In a good many dairy-barns much unnecessary work is required because no thought was given to the distance the milk must be carried. This point is very important. Not only have the cows to be milked twice a day and the milk carried to the milk-room, but large quantities of skim-milk must be carried back to be fed to the calves. The carrying of milk alone entails a good deal of labour. If the milk from each cow in a stable of forty or fifty cows is carried 25 feet farther than necessary each day, the additional and unnecessary distance travelled by the milkers in a year would amount to several hundred miles. The same principle applies to the calf-pens. Place them where no extra steps need be taken in feeding.

The milk-room should be situated on the north side of the stable, either adjoining or not far distant. It should be well supplied with ice for the summer. The use of a little ice in summer around the cream-cans will make a great difference in the grade, and often several cents difference in the price received per gallon. Ice and milk houses are dealt with in another section of this bulletin.

Flooring.—Earth floors are not satisfactory in barns where cattle are tied, because it becomes worn into hollows that hold the water and are impossible to keep clean. For box stalls, however, no better material can be found. Plank or cement are by far the best form of flooring for stalls. Cement is more durable and easier to clean, but has the disadvantage of being cold and hard and must be kept well bedded at all times or else udder troubles are likely to develop. Plank floors are softer, warmer, less slippery, and more comfortable for the cows, and less bedding is required than where cement is used. Their disadvantage lies mainly in the fact that they are not quite as sanitary nor as durable.

Gutters.—The gutters should be of concrete at least 16 inches wide and 7 inches deep on the stall side, and about 4 or 5 inches deep on the alley side. The bottom should slope slightly toward one end, where a drain should be located to carry off surplus water when the stable

is being washed out. As far as the liquid manure is concerned, it will be readily absorbed by the litter if cut straw or chaff is used freely.

Mangers.—Either wood or cement may be used, the object simply being to provide a place from which the animal may eat without wasting the food. Tight bottoms that may be easily cleaned are essential. Plans and measurements for satisfactory mangers are given in Figs. 15 and 16.

Stalls.—It is very important that the platform on which the cows stand should be just the right length. If they are too long it is impossible to keep the cows clean. If they are too short the cows must stand in the gutter and are uncomfortable and get dirty. A length of 5 feet from the rear of the manger to the edge of the gutter is about right for the average cow. The standard width of a single stall is 3 feet 6 inches, and of a double stall 6 feet 6 inches.

A good method of constructing stalls to suit cows of varying sizes is to make the stall floor 5 feet wide from manger to gutter at one end of the row and 4 feet 8 inches wide at the other. This arrangement will thus provide for animals of different ages and sizes.

Stall partitions are sometimes used, either wood or iron being suitable for this purpose. They are not strictly necessary if the cows are tied in swinging stanchions, but when they are tied with chains to the sides of double stalls a partition between each double stall is required. They need run only far enough back from the manger to keep the animals from hooking each other. This type of stall and cattle-tie is shown in Fig. 16. Rigid stanchions are sometimes used, but are by no means as comfortable as either the swinging stanchion (shown in Fig. 15) or the chain tie (Fig. 16).

Dairy Barn Plans.

In this bulletin it is intended to deal more particularly with the construction and equipment of dairy-barns suitable for Western conditions. The needs of the average farmer have been kept in mind in dealing with the subject. The barns shown are all economical to build, permanent, comfortable, sanitary, and have stables conveniently arranged. It is recognized that the conditions and requirements of farmers will vary, and therefore the plans here presented will not suit everybody. They can, however, easily be modified to meet individual requirements, and will at least give valuable suggestions.

Dairy Barn No. 1.

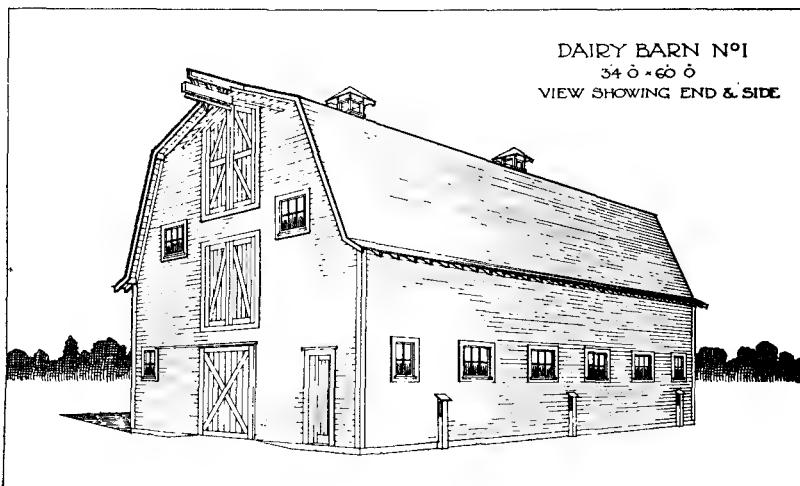
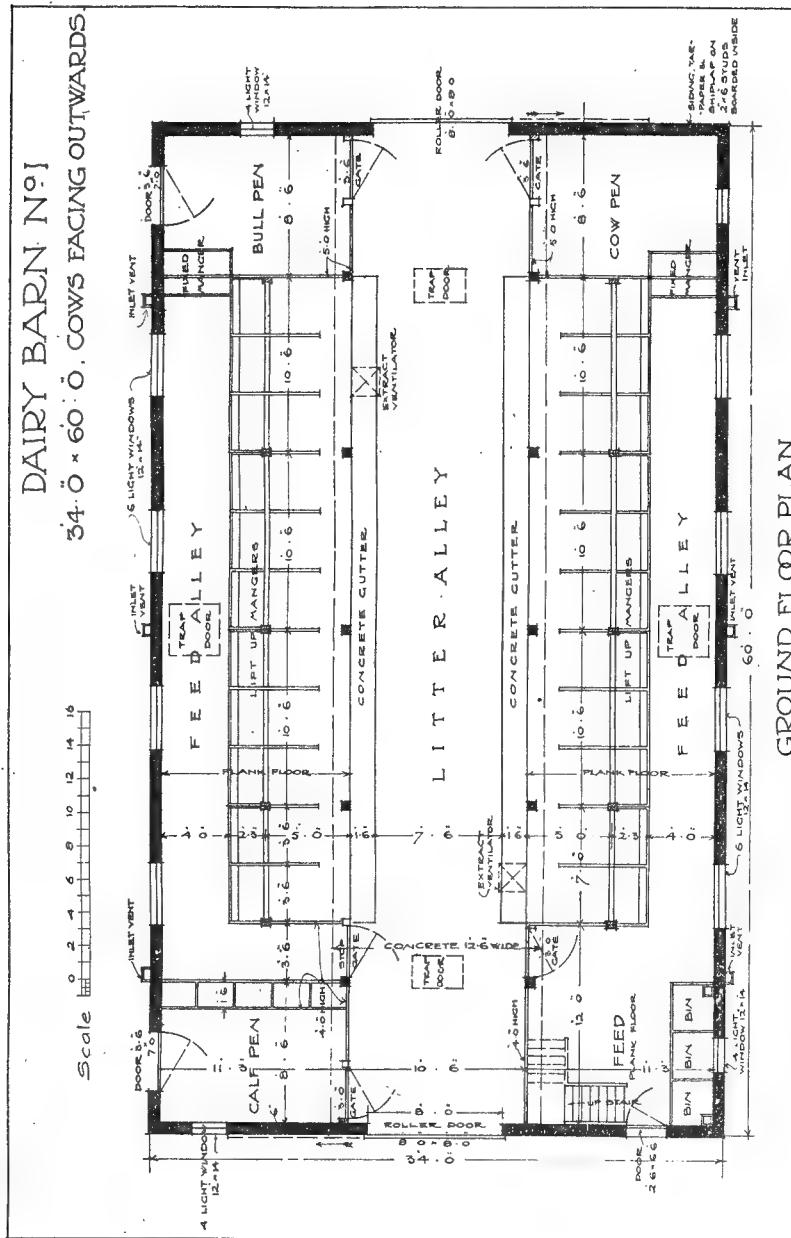


Fig. 1. A well-proportioned barn of medium size with accommodation for about thirty head (including calves).

In Fig. 2 is shown the ground-floor plan of a dairy-barn 34 x 60 feet, with accommodation for twenty-two cows in single stalls. Two roomy box stalls are provided at one end, one for keeping a stock bull and the other suitable for using as a maternity-box for cows about to calve. A calf-pen is located at the opposite end, where it will be handy both to the milk-room (which should be placed near this end of the barn) and also to the feed-room. Provision is made in the feed-room for good-sized feed-bins, ample floor-space for mixing feeds, and a stairway to the loft. If a silo is used it should open into the feed-room from the end of the barn. An outside door is shown on the end wall of the barn opening into the feed-room. This will be much handier for general use as an entrance than the big doors. Its use also helps to keep the barn warmer, because in severe winter weather the opening of large stable doors should be eliminated as much as possible. The large doors of this barn will allow a manure-spreader or a truck wagon to be drawn through the litter-alley for removal of manure.

The stalls and mangers have already been discussed. The mangers here are the lift-up kind (*see* Fig. 15), except those in the box stalls, which are stationary, but are so arranged that the feed can be placed in them from the passage-way without the necessity of entering the stalls (*see* Fig. 16).



ESTABLISHED COOP PLAN

Fig. 2. Comfortable for the cows and convenient to work in.

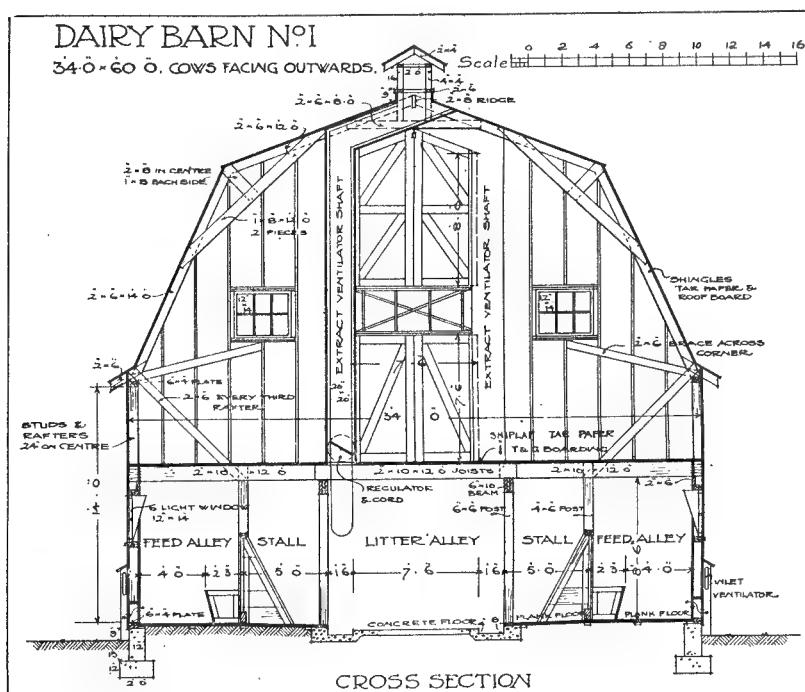


Fig. 3. These barns are amply strong and wind-firm and give the maximum of storage-space in the loft.

BILL OF MATERIAL, DAIRY BARN NO. 1.

Framing Lumber.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
5	In. 2	In. 12	Ft. 14	140	Feed-room wall planking fixed horizontally to side next cow-stalls.
9	2	12	8	144	Feed-room wall planking side next litter-alley.
2	2	12	16	64	Stair-strings.
2	2	12	8	32	Bottoms of fixed mangers, to cut 4 pieces 4'.
39	2	12	10	780	Plank floor to cow-stalls, to cut 78 pieces 5'.
40	2	12	14	1,120	Plank floor to feed-alley, to cut 80 pieces 6' 9".
12	2	12	12	288	Plank floor to feed-room.
22	2	12	10	440	Plank stall divisions, cut to suit.

BILL OF MATERIAL, DAIRY BARN No. 1—*Continued.*
Framing Lumber—Continued.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
12	2	10	20	400	Spiked together to form 6 x 10 beams under floor-joists. Where the 6 x 10 beams joint over 6 x 6 posts, a corbel 2' long, 6 x 6, should be placed under such joint.
12	2	10	12	240	
96	2	10	12	1,920	Floor-joists for hay-loft. (NOTE.— These joints will lap 12" over 6 x 10 beams and must be well spiked together.)
2	2	10	8	27	Fronts of fixed mangers, to cut 4 pieces 4'.
16	2	8	8	171	Struts from braces to hip of roof.
4	2	8	18	96	Ridge.
4	2	8	22	117	Spiked together to form 4 x 8 manger fronts between 4 x 6 posts.
4	2	8	18	96	
3	2	8	14	56	Treads and landing to stairs, to cut 18 pieces 2' 3".
18	2	8	12	288	Lift-up manger fronts next to feed-alleys, to cut 18 pieces 10' 6".
3	2	8	14	56	Lift-up manger fronts next to feed-alleys, to cut 6 pieces 7'.
15	2	8	12	240	Short lengths forming divisions between each manger.
58	2	6	14	812	Wall-studs between sills and roof-plate.
25*	2	6	16	400	Sills on concrete foundation-walls doubled to make 4 x 6.
8	2	6	12	96	Studs under windows to cut 8 pieces 4' 6", and studs above windows to cut 8 pieces 6' 6".
12	2	6	14	168	Trimmings for large window openings, to cut 48 pieces 3' 6".
4	2	6	10	40	Trimmings for small window openings, to cut 16 pieces 2' 6".
3	2	6	14	42	Extra studs for single outside door openings.
4	2	6	8	32	Extra studs for roller door openings.
2	2	6	14	28	Trimmings to door-heads, to cut 2 pieces 9' and 2 pieces 4' 6".
20	2	6	18	360	Studs for end wall of barn.
12	2	6	14	168	Studs for end wall of barn.
12	2	6	10	120	Studs for end wall of barn.
4	2	6	8	32	Studs for end wall of barn.
8	2	6	20	160	Studs for end wall of barn.
6	2	6	16	96	Studs for end wall of barn.

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

BILL OF MATERIAL, DAIRY BARN NO. 1—Continued.

Framing Lumber—Continued.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
2	2	6	12	24	Studs for end wall of barn.
30	2	6	8	240	3 pieces spiked together for each 6 x 6 post to carry beams.
2	2	6	8	16	Door-posts to feed-room.
66	2	6	14	924	Lower rafters.
66	2	6	12	792	Upper rafters.
8	2	6	16	128	Rafters to projecting roof over hay-fork track at ends of building.
32	2	6	8	256	Collar-ties to carry hay-fork track.
4	2	6	12	48	Braces across corners of barn from roof-plate to under hay-loft windows.
7*	2	6	16	112 {	Ribbon under hay-loft floor-joists, notched 1" into wall-studs.
1*	2	6	8	8 {	
34	2	6	6	204	Look-out rafters at eaves, to cut 68 pieces 3'.
15*	2	6	16	240 {	Roof-plate, doubled to make 4 x 6.
2*	2	6	10	20 {	
22	2	6	10	220	Braces on every third rafter from roof-plate to floor-joists.
18	2	6	10	180	Spiked to form 4 x 6 posts at every third stall division.
4	2	6	8	32	Locking-bars to hay-loft doors.
8	2	6	12	96	Rails on both sides of uprights to bull and cow pens.
4	2	6	10	40	Rails on both sides of uprights, to cut 8 pieces 5', to cow and bull pens.
2	2	6	12	24 {	To cut 6 pieces 4' and 4 pieces 5'. Material for 2 gates 4' wide, 5' high, to cow and bull pens.
2	2	6	10	20 {	
1	2	6	8	8	Centre rail to mangers.
16	2	4	4	43	Corner-posts to roof ventilators, doubled to form 4 x 4.
2	2	4	12	16	To cut small rafters to roof of ventilator-shaft.
2	2	4	8	11	Plate under small rafters in roof ventilator, to cut 8 pieces 2'.
28*	2	4	12	224	Sill pieces laid on the earth under plank floors.
4	2	4	22	59	Spiked together to form 4 x 4 head-rail in stall divisions.
7	2	4	10	47	Uprights at each stall division between manger front and head-rail, to cut 14 pieces 5'.

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

BILL OF MATERIAL, DAIRY BARN NO. 1—Continued.

Framing Lumber—Continued.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
	In.	In.	Ft.		
22	2	4	6	88	Capping on stall divisions.
4	2	4	16	43	Framing to bins on loft floor.
16	2	4	8	85	Door-battens to loft doors.
20	2	4	4	53	Rails to loft doors.
4	2	4	8	21	Braces to loft doors.
4	2	4	10	27	Braces to loft doors, to cut 8 pieces 5'.
10	2	4	8	53	Battens and rails to roller doors.
4	2	4	10	27	Braces to roller doors.
2	2	4	16	21	Battens, rails, and braces to calf-pen,
3	2	4	14	28	bull-pen, and feed-room outside
3	2	4	16	32	doors.
124	1	8	12	992	Braces on both sides of all rafters.
32*	1	8	8	171	Cleats on each side of roof-struts, to cut 136 pieces 2'.
2	4	8	10	53	Projecting beam for hay-fork track outside of each end of barn.
2	4	8	10	53	Corbels on posts under beams, to cut 10 pieces 2'.
1	4	4	16	21	Supporting posts to stairs.
2	1	10	8	13	Fronts of mangers next to feed-alley, to cut 4 pieces 4'.
2	1	10	12	20	Calf-pen manger fronts.
1	1	10	12	10	Calf-pen manger bottom.
1	1	12	10	10	Calf-pen manger divisions.
1	1	6	16	8	Framing and bracing for gates to feed-alleys.
2	1	6	12	12	Rails on both sides of calf-pen fronts, to cut 4 pieces 11' 3".
4	1	6	12	24	Rails on both sides of calf-pen fronts, to cut 4 pieces 5'.
2	1	6	10	10	Rails on both sides of calf-pen fronts, to cut 4 pieces 5'.
1	1	6	12	6	Battens to gate of calf-pen, to cut 4 pieces 3'.
20	1	6	10	100	Uprights to bull and cow pens, to cut 39 pieces 5'.
4	1	6	10	20	For gates to bull and cow pens, to cut 8 pieces 5'.
1	1	6	8	4	Manger fronts next feed-alleys, to cut 2 pieces 4'.
44	1	4	6	88	Cleats on both sides 2" plank stall divisions, to cut 44 pieces 6' and 44 pieces 5'.
22	1	4	10	73	Uprights for gates to feed-alleys.
2	1	4	16	11	Short-length cleats and rails to each cow-stall manger division.
24	1	4	12	96	

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

BILL OF MATERIAL, DAIRY BARN No. 1—*Continued.**Framing Lumber*—Concluded.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
	In.	In.	Ft.		
7	1	4	8	19	Uprights to calf-pen, to cut 14 pieces 4'.
3	1	4	8	8	Pivoted uprights to calf-pen, to cut 6 pieces 4'.
30*	2	2	20	200	Bridging to joists.
8	2	2	20	53	Framing for ventilator-shafts.
2	2	2	14	9	Framing for ventilator-shafts.
3	1	4	8	8	Gate uprights to calf-pen, to cut 6 pieces 4'.
18	1	2	16	48	Door and window stops.
1	1	2	12	2	Door and window stops.
Total framing lumber				15,921	

Finish Lumber.

1	2	10	16	27	Hay-loft door-frames.
5	2	8	16	107	Hay-loft door-frames.
5	2	8	12	80	Window-sills, to cut 12 pieces 4' and 4 pieces 3'.
16	1	12	6	96	Side cheeks to all windows, to cut 32 pieces.
6	1	12	4	24	Fronts to fresh-air inlets.
8	1	8	16	86	Frieze to side walls.
2	1	8	10	13	Chutes to feed-bins.
16	1	8	10	107	Window-frame.
2	1	8	16	21	Door-frames.
4	1	8	16	43	Fascia at gables.
4	1	8	14	37	Fascia at gables.
2	1	8	10	13	Door-frames.
3	1	8	14	28	Door-frames.
1	1	8	12	8	Door-frames.
2	1	6	10	10	Chutes to feed-bins.
12	1	6	4	24	Sides to fresh-air inlets.
5	1	6	16	40	Door-casings.
8	1	6	14	56	Frieze at gables.
3	1	6	14	21	Door-casings.
1	1	6	12	6	Door-casings.
8	1	6	10	40	Door-casings.
4	1	6	16	32	Corner-boards.
5	1	6	14	35	Ridge cover-boards.
5	1	5	14	29	Ridge cover-boards.
4	1	5	16	27	Corner-boards.

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

BILL OF MATERIAL, DAIRY BARN No. 1—*Concluded.**Finish Lumber*—Concluded.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
4	1	4	14	19	Window-casings.
8	1	4	12	32	Window-casings.
2	1	4	8	5	Window-casings.
1	1	10	14	12	Roof of fresh-air inlets, to cut 6 pieces.
Total finish lumber			1,078		

2,500 feet, board measure, 1" tongued and grooved flooring.

4,340 feet, board measure, drop-siding.

4,000 feet, board measure, shiplap on outside walls.

2,500 feet, board measure, shiplap under loft floor.

3,600 feet, board measure, roof-boarding, laid close. (NOTE.—If open boarding is desired, 2,400 feet, board measure, will suffice.)

33,000 shingles, British Columbia Red Cedar, laid 4" to the weather on roof-slope above hip and 5" to the weather on roof-slope below hip (132 bundles).

1,200 feet, board measure, shiplap fixed in two thicknesses to form extract ventilator-shafts and bins on hay-loft floor and feed-room.

4,000 feet, board measure, shiplap lining to inside of walls and ceiling to lower story.

26 rolls of tar-paper.

200 feet, board measure, 1" V-joint in 16' lengths for upper doors to loft.

140 feet, board measure, 1" V-joint in 16' lengths for lower doors to loft.

180 feet, board measure, 1" V-joint in 16' lengths for roller doors.

100 feet, board measure, 1" V-joint in 14' lengths for outside doors to bull-pen, calf-pen, and feed-room.

12 6-light sashes, glass 12" x 14"; outside size of sash 3' 4½" x 2' 9".

4 4-light sashes, glass 12" x 14"; outside size of sash 2' 4½" x 2' 9".

Hardware.

300 lb. 4" common nails.

20 lb. 5" spikes.

200 lb. 2½" common nails.

140 lb. 2¼" flooring-nails for siding and flooring.

80 lb. 3½" common nails.

20 lb. 2" finishing-nails.

150 lb. 1¼" shingle-nails, zinc-clad, best-quality galvanized, or cut iron.

28 ½" x 8" bolts, with nut and large washers, for bolting down the sills to concrete foundations.

15 pairs 6" strap-hinges for lift-up mangers to stalls.

16 spring-bolts for window fastenings.

3 pairs 12" T-hinges for bull, cow, and calf pen gates.

5 pairs 12" strap-hinges for doors to feed-room and outside doors to calf and bull pens.

2 16' lengths single track for roller doors.
 2 pairs roller-door wheels and strap-hangers.
 2 pairs 12" T-hinges for feed-alley gates.
 4 pairs 12" strap-hinges for trap-doors.
 5 8" barrel-bolts for doors and gates to pens.
 2 barn-door latches.
 10 lineal feet $\frac{3}{8}$ " x $1\frac{1}{4}$ " iron bar for sliding stanchions to calf-pen.
 6 $\frac{1}{2}$ " x 6" bolts for bottom of calf stanchions.
 6 $\frac{1}{2}$ " x 2" bolts for top of calf stanchions.
 2 $\frac{3}{8}$ " x 24" round-iron rods for pivots for dampers to extract ventilators.
 22 metal stanchions for cows.
 10 pairs 18" heavy strap-hinges for loft doors (opening inwards).
 8 iron sockets for locking-bars to hay-loft doors.
 12 pieces fine wire netting, 4" x 20", fixed over outside slot openings to fresh-air inlets.
 68 lineal feet hay-fork carrier track.
 36 hangers for hay-fork carrier track.
 1 staple and padlock to outside door to feed-room.
 2 4" heavy iron hooks and eyes to fasten roller doors on inside.
 16 5" T-hinges for windows.
 2 4" hooks and eyes to stop-gates to litter-alley.
 4 $\frac{1}{2}$ " x 6" bolts for locking-bars.
 40 cubic yards of gravel.
 200 bags of cement.

NOTE.—This bill of material includes everything necessary for the building itself, but does not include anything for scaffolding. Alternative quantities are given for two methods of roof-boarding—close and open—the choice being left to the builder. Close boarding is better where there is no hay-loft over the animals; where hay-lofts are shown open boarding will answer.

Dairy Barn No. 2.

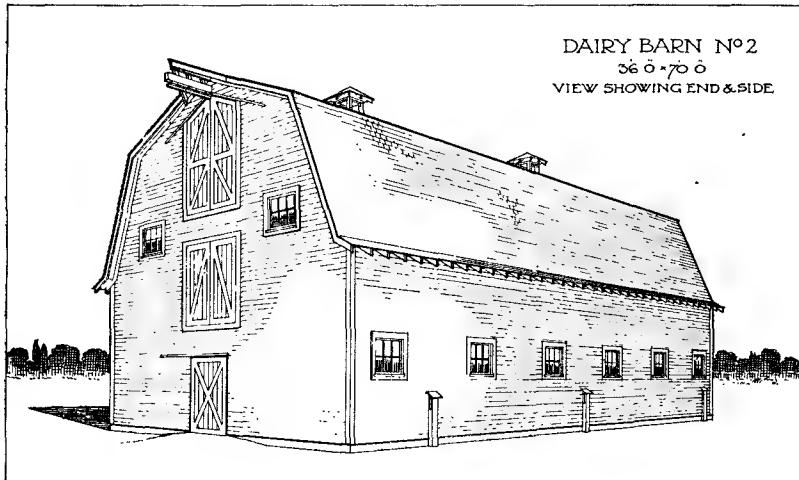


Fig. 4. All the barn lofts have two doors at each end, the upper one being intended for use with a horse-fork.

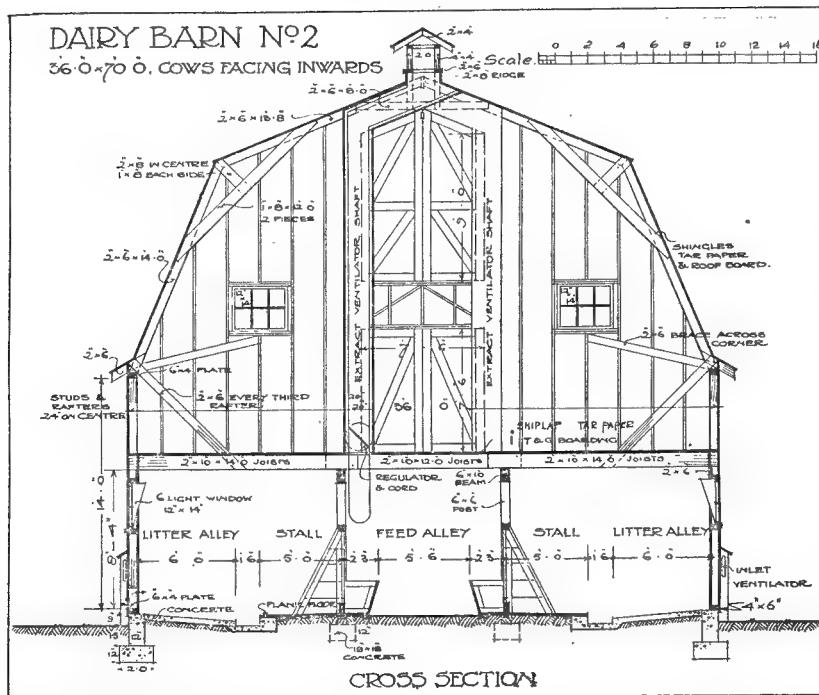


Fig. 6. The extract ventilating-shafts are placed so as to allow a clear passage right through the loft for the hay-fork.

This barn is 36 x 70 feet and will accommodate twenty-four cows in single stalls, has two box stalls for freshening cows, a bull-pen, and a calf-pen. The cows face toward the centre alley instead of toward the wall, as in Dairy Barn No. 1. This arrangement is rather handier for feeding, but requires slightly more labour in removing the manure. It is impossible, too, with this arrangement of stalls in a 36-foot barn to have manure-alleys wide enough to admit a wagon or manure-spreader. A stone-boat or a litter-carrier, however, can be used to advantage.

The feed-room is located in the corner and opens directly on to the feed-alley. The calf-pen is also handy, being located just across the alley from the feed-room and only a short distance from the milk-room. Earth floors are shown in the box stalls and plank in the single stalls and litter-alleys, the gutter being made of concrete. The doors opening outside in both the calf-pen and the bull-pen are convenient for turning the animals out for exercise into adjoining paddocks.

BILL OF MATERIAL, DAIRY BARN No. 2.

Framing Lumber.

No. of Pcs.	Thick. In.	Wide. In.	Long. Ft.	Feet Board Measure.	Used for.
2	4	8	10	53	Hay-fork beams.
4	4	8	6	64	Corbels under beams, to cut 12 pieces 2'.
46	2	12	14	1,288	Plank floors to stalls, to cut 92 pieces 6' 8".
24	2	12	10	480	To cut into short lengths for stall divisions.
2	2	12	12	48	Manger bottoms to cow and bull pens.
2	2	12	12	48	Stair-strings to feed-room.
14	2	12	14	392	Plank walls to feed-room.
6	2	10	12	120	
6	2	10	18	180	
6	2	10	20	200	
6	2	10	22	220	
2	2	10	10	33	Manger ends to cow and bull pens.
2	2	10	12	40	Manger fronts to cow and bull pens.
72	2	10	14	1,680	Floor-joists.
36	2	10	12	720	Floor-joists.
5	2	8	16	107	Ridge.
20	2	8	8	213	Struts from hip of roof to 1 x 8 braces, to cut 76 pieces 2'.
3	2	8	14	56	Spiked together to form 4 x 8 manger front next to cow-stalls.
12	2	8	10	160	
4	2	8	14	75	Manger fronts next to feed-alley.
18	2	8	12	288	Manger fronts next to feed-alley.
1	2	8	8	11	Manger-fronts next to feed-alley.
3	2	8	14	19	Stair-treads, to cut 15 pieces 2' 3".
3	2	8	8	32	
60	2	6	14	840	Studs from sills to roof-plate.
11	2	6	12	132	Studs above and below windows.
6	2	6	14	84	Double studs to door openings.
15	2	6	16	240	Trimmings around window openings.
6	2	6	16	96	Trimmings to door-heads.
8	2	6	20	160	Studs to end walls of barn.
8	2	6	8	64	Studs to end walls of barn.
4	2	6	14	56	Studs to end walls of barn.
12	2	6	18	216	Studs to end walls of barn.
12	2	6	22	264	Studs to end walls of barn.
12	2	6	16	192	Studs to end walls of barn.
36	2	6	8	288	6 x 6 posts under beams (3 pieces 8' long, 2 x 6, spiked together to form 1 post).
76	2	6	14	1,064	Rafters to lower slope of roof.
76	2	6	14	1,064	Rafters to upper slope of roof, to cut 13' 8".
38	2	6	8	304	Collar-ties to each rafter.

BILL OF MATERIAL, DAIRY BARN No. 2—Continued.

Framing Lumber—Continued.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
	In.	In.	Ft.		
24	2	6	10	240	Braces from roof-plate to floor-joists of hay-loft on every third rafter.
38	2	6	6	228	Look-out rafters at eaves, to cut 76 pieces 3'.
4	2	6	12	48	Braces across corners of building from roof-plate to under hay-loft windows.
2	2	6	10	20	Sills to ventilators above roof, to cut 8 pieces 2' 6".
25*	2	6	16	400	Doubled to form 4 x 6 sills on concrete foundation-walls.
2*	2	6	10	20	
18*	2	6	16	288	
4*	2	6	12	48	Doubled to form 4 x 6 roof-plate.
8*	2	6	16	128	Ribbon under joists.
1*	2	6	12	12	Ribbon under joists.
1*	2	6	10	10	Ribbon under joists.
14	2	6	10	140	Rails on both sides of uprights at top and bottom of cow and bull pens.
6	2	6	16	96	(Note.—Bull-pen has centre rail in addition.)
4	2	6	8	32	
1	2	6	12	12	Centre rail to cow and bull pen mangers.
17	2	6	16	272	Plank floor to feed-room, to cut 17 pieces 14' 11".
8	2	4	8	43	16 pieces 4', doubled to form 4 x 4 posts to extract ventilators above roof.
2	2	4	8	11	Plate to roof of ventilators, to cut 8 pieces 2'.
2	2	4	16	21	Rafters to ventilator roofs.
8	2	4	8	43	Framing to large bins on hay-loft floor, to cut 16 pieces 4'.
9	2	4	16	96	
9	2	4	14	84	Sill pieces on earth under plank floors.
2	2	4	12	16	
3	2	4	14	28	
12	2	4	10	80	Spiked together to form 4 x 4 head-rail.
5	2	4	14	47	Upright supports between 4 x 8 manger fronts and 4 x 4 head-rails, to cut 15 pieces 4' 6" long and 4 pieces 5' long.
2	2	4	10	13	
24	2	4	6	96	Capping on stall divisions.
10	2	4	10	67	Uprights at corners and gate openings, to cut 20 pieces 5'.

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

BILL OF MATERIAL, DAIRY BARN No. 2—Continued.

Framing Lumber—Continued.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
6	2	4	4	16	Uprights at corners and door openings of calf-pen.
2	2	4	16	21	Bearers under all manger bottoms.
2	2	4	18	24	Sills on earth under feed-room floor, to cut 4 pieces 8' 8".
3	2	4	8	16	Rails to cow-pen gates, to cut 6 pieces 4'.
4	2	4	16	43	Rails and braces for outside doors in two heights.
4	2	4	10	27	
2	2	4	16	21	Rails and braces for roller doors.
2	2	4	14	19	Rails and braces for roller doors.
7	2	4	12	56	
6	2	4	16	64	Rails and braces to upper and lower hay-loft doors.
10	2	4	10	67	
2	2	4	12	16	Door-track fixing.
30*	2	2	20	200	Bridging to joists.
18	2	2	12	72	Studs at corners of ventilating-shaft.
1	1	12	10	10	Calf-manger divisions.
2	1	10	12	20	Manger backs to cow and bull pens.
2	1	10	14	23	Calf-manger fronts.
1	1	10	14	12	Calf-manger bottoms.
16	1	8	12	128	Cut into short lengths for manger divisions for cow-stalls.
40*	1	8	8	213	Cleats on both sides of struts, to cut 152 pieces 2'.
152	1	8	12	1,216	Braces on both sides of all rafters.
1	1	6	12	6	Manger backs to cow and bull pens.
2	1	6	14	14	Calf-pen partitions and stanchions.
4	1	6	12	24	Calf-pen partitions and stanchions.
2	1	6	8	8	Calf-pen partitions and stanchions.
1	1	6	10	5	Rails and braces to feed-room door.
1	1	6	8	4	Rails and braces to feed-room door.
24	1	6	4	48	Stop-gates and calf-pen gates.
6	1	6	10	30	Uprights to cow-pen gates, to cut 12 pieces 5'.
24	1	4	10	80	Upright cleats on both sides of stall divisions, to cut 48 pieces 5'.
30	1	4	4	40	Uprights to calf-pen.
48	1	4	6	96	Cleats on both sides of stall divisions under capping.
24	1	4	12	96	Cleats to manger divisions.
Total framing lumber				16,965	

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

BILL OF MATERIAL, DAIRY BARN No. 2—Concluded.

Finish Lumber.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
5	2	8	12	60	Window-sill.
6	1	12	4	24	Fronts to fresh-air inlets.
15	1	12	6	90	Side cheeks to windows, to cut 30 pieces.
1	1	10	14	12	Roofs to fresh-air inlets, to cut 6 pieces.
4	1	8	16	43	Fascia at gables.
4	1	8	14	37	Fascia at gables.
2	1	8	10	13	Chutes to feed-bins.
9*	1	8	16	96	Frieze to side walls.
15	1	7	10	88	Window-frames.
6	1	7	10	35	Door-frames.
4	1	7	16	37	Door-frames.
6	1	7	14	49	Door-frames.
1	1	7	12	7	Door-frames.
2	1	7	8	9	Door-frames.
2	1	6	10	10	Chutes to feed-bins.
4	1	6	16	32	Frieze at gables.
4	1	6	14	28	Frieze at gables.
12	1	6	4	24	Sides to fresh-air inlets.
6	1	6	14	42	Door-casings, to cut 12 pieces.
1	1	6	12	6	Door-casings.
2	1	6	10	10	Door-casings.
3	1	6	16	24	Door-casings to hay-loft doors.
6	1	6	10	30	Door-casings to hay-loft doors.
4	1	6	16	32	Corner-boards.
5	1	6	16	40	Ridge cover-board.
2	1	6	12	12	Cover-boards to sliding-door track.
5	1	5	16	33	Ridge cover-board.
4	1	5	16	27	Corner-boards.
15	1	4	16	80	Window-casing.
Total finish lumber				1,050	

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

250 feet, board measure, 1" V-joint in 14' lengths to cut 7' for all lower doors.

160 feet, board measure, 1" V-joint in 8' lengths for lower doors of hay-loft.

200 feet, board measure, 1" V-joint in 10' lengths for upper doors of hay-loft.

5,600 feet, board measure, drop-siding to all outside walls.

5,300 feet, board measure, shiplap on all outside walls.

3,000 feet, board measure, shiplap to loft floor.

4,700 feet, board measure, 1" shiplap lining to inside walls and ceiling to lower story.

4,800 feet, board measure, 1" sawn board or shiplap to roof, laid close. (NOTE.—If open boarding is desired, 3,200 feet, board measure, will suffice.)
 1,400 feet, board measure, shiplap fixed in two thicknesses to form ventilator-shafts and bins.
 3,000 feet, board measure, 1" tongue and groove flooring to hay-loft floor.
 43,000 British Columbia Red Cedar shingles (172 bundles).
 30 rolls of tar-paper.
 15 6-light sashes, glass 12" x 14"; outside size of sash 3' 4½" wide by 2' 9" high.

Hardware.

32 5/8" x 8" bolts and nuts, with large double washers, for bedding in concrete foundation.
 215 lb. 1¼" shingle-nails, zinc-clad, best-quality galvanized, or cut iron.
 300 lb. 4" common nails.
 25 lb. 5" spikes.
 200 lb. 2½" common nails.
 160 lb. 2½" flooring-nails for siding and flooring.
 90 lb. 3½" common nails.
 15 spring-bolts for window fastenings.
 15 pairs 5" T-hinges for windows.
 4 pairs 12" T-hinges for cow and calf pen gates.
 8 pairs 18" T-hinges for outside doors to bull-pen and calf-pen and doors at end of litter-alleys.
 2 10' lengths of single track for roller doors.
 2 pairs roller-door wheels and strap-hangers.
 2 pairs 12" T-hinges for stop-gates to feed-alleys.
 2 pairs 12" strap-hinges for trap-doors.
 10 8" barrel-bolts for all ground-floor doors and gates.
 9 lineal feet 3/8" x 1¼" iron bar and bolts for sliding stanchions to calf-pen.
 4 lineal feet 3/8" x 1¼" iron bar and bolts for sliding stanchions to calf-pen.
 24 metal stanchions for cows.
 2 3/8" round-iron bars 24" long for extract ventilators.
 10 pairs 18" heavy strap-hinges for loft doors (to open inwards).
 8 wrought-iron sockets for locking-bars to hay-loft doors.
 12 pieces fine wire netting, 4" x 20", fixed over outside slot openings to fresh-air inlets.
 78 lineal feet hay-fork carrier track.
 40 hangers for hay-fork track.
 10 ½" x 6" bolts at bottom of calf stanchions.
 10 ½" x 2" bolts at top of calf stanchions.
 4 barn-door latches.
 4 ½" x 6" bolts for locking-bars.
 35 cubic yards of gravel.
 140 bags of cement (5 tons).

NOTE.—This bill of material includes everything necessary for the building itself, but does not include anything for scaffolding. Alternative quantities are given for two methods of roof-boarding—close and open—the choice being left to the builder. Close boarding is better where there is no hay-loft over the animals; where hay-lofts are shown open boarding will answer.

Dairy Barn No. 3.

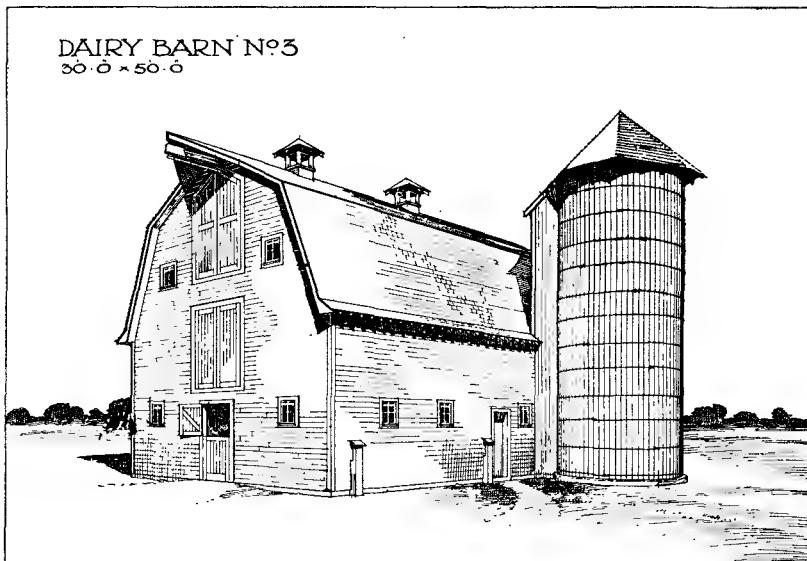


Fig. 7. Economical of space, of good proportions, and very handy to work in. The silo is shown in its proper place, close to and connected with the feed-room.

This barn, 30 feet wide by 50 feet long, provides for sixteen cows in double stalls, and also has three well-arranged box stalls for the use of calves, freshening cows, and a stock bull. The barn is economical of space, of good proportions, and very handy to work in.

The feed-room is centrally located and large, with ample space for mixing feeds. Inside it are chop-bins located along one side, a stairway to the loft, and a combined hay-chute and ventilation-shaft which allows roughage to be dropped from the loft to the middle of the floor. The silo opens directly into the feed-room, and if desired a root-cellар can be placed under the feed-room floor, where it is much handier than a root-house located some distance from the barn.

The doors of the box stalls are arranged to open nearly in a direct line with the litter-alley, so animals can be driven in and out easily and directly. A swing-gate on the entrance to the litter-alley prevents loose cows from gaining access to the feed-room.

A good feature about this barn is the fact that it has only two outside doors, which makes it much warmer than where five or six outside doors are used. The 4-foot door in the centre at one end of the barn

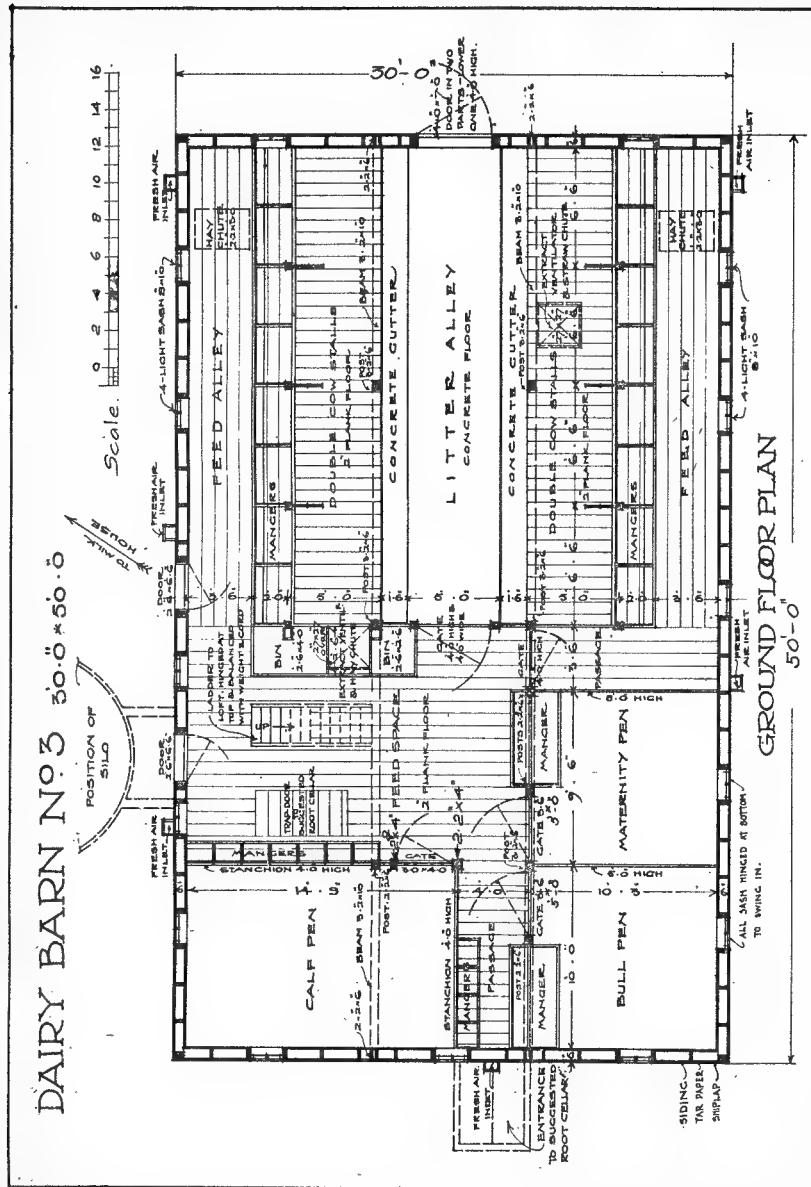


Fig. 8. Accommodation for about twenty-five head, including calves. The feed-room is centrally located, with plenty of room for mixing feed.

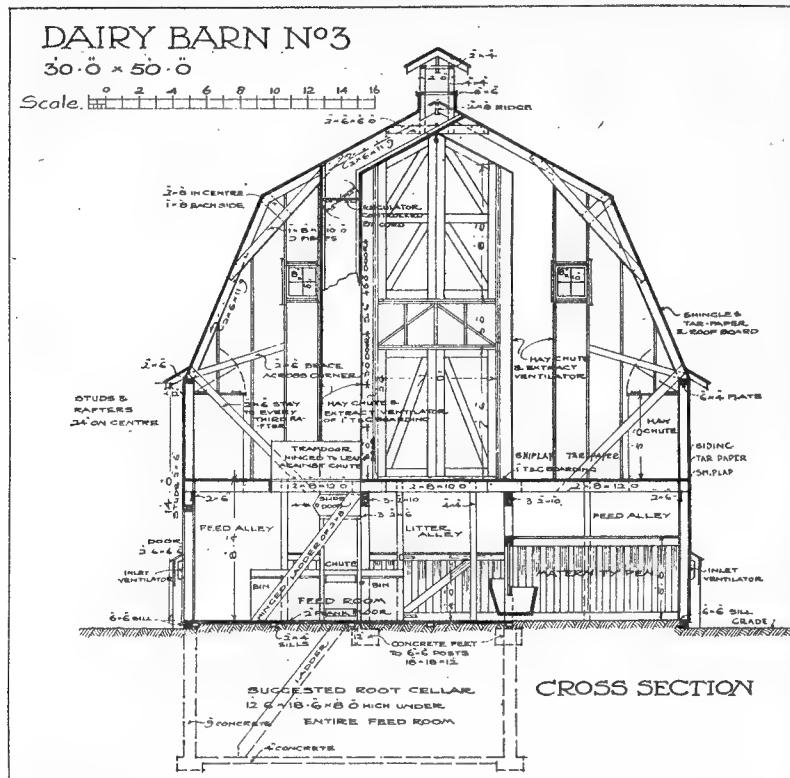


Fig. 9. The ladder to the loft can be pushed up out of the way when not in use. A root-cellар in the position indicated is much handier than one outside the barn.

allows the cattle to pass in and out, and the 2-foot 6-inch door on the north side of the barn is in practically a direct line with the feed-room, the calf-pens, and the milk-house.

If one desires to keep more cows than sixteen, it is only necessary to extend the length of the barn. Each 10 feet added means accommodation for six more cows and storage capacity overhead for about 7 tons of hay. Thus a barn of this kind, 60 feet long, would hold about twenty-two cows in stalls, and one 70 feet long would hold about twenty-eight. If a barn longer than 60 feet is built, however, it would be advisable to leave a passage from the litter-alley to the feed-alley on the north side in order to save steps in carrying the milk to the milk-room.

Plank or cement flooring can be used in the feed-room and stalls, although earth will be found to be satisfactory in the box stalls. Double stalls, stationary mangers, and chain ties are specified in this plan. These could be converted easily into single stalls with swinging stanchions if preferred, as all the stalls are standard size.

BILL OF MATERIAL, DAIRY BARN No. 3.

Framing Lumber.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
4	6	6	16	192	Sills under studs, side walls.
2	6	6	16	96	Sills under studs, end walls.
2	6	6	14	84	Sills under studs, end walls.
4	6	6	10	120	Sills under studs, side walls.
18	2	10	14	420	Spiked together to form 6 x 10 beams under hay-loft joists.
12	2	10	14	280	Cow-stall manger fronts next to feed-alleys.
3	2	10	14	70	Cow-stall manger divisions against posts.
2	2	10	14	47	Cow-stall manger divisions at centre of each stall.
6	2	10	12	120	Spiked together to form 6 x 10 beams under hay-loft joists.
2	2	10	6	20	Manger fronts in pens.
1	2	10	10	17	Manger fronts in pens, to cut 2 pieces 5'.
12	2	10	8	160	Cow-stall divisions.
2	4	6	6	24	Corbels on posts under beams, to cut 6 pieces 2'.
2	4	8	10	53	Extension pieces to carry hay-fork track outside of building.
4	2	8	16	85	Ridge.
4	2	8	14	75	Cow-stall manger fronts next stalls.
52	2	8	12	832	Floor-joists to hay-loft.
1	2	8	12	16	Rail over centre of pen mangers, to cut 1 piece 6' and 1 piece 5'.
26	2	8	10	347	Floor-joists to hay-loft.
2	2	8	10	27	Sides to ladder to loft.
10	2	8	8	107	Struts from braces to rafter joints, to cut 50 pieces 1' 6".
8	4	4	4	43	Ventilator corner-posts above roof.
8	2	6	20	160	Studs to large door openings of hay-loft.
8	2	6	20	160	Studs, end wall.
4	2	6	18	72	Studs, end wall.
4	2	6	16	64	Studs, end wall.
18	2	6	8	144	Studs, end wall.
4	2	6	16	64	Trimmings to door openings to hay-loft.

BILL OF MATERIAL, DAIRY BARN No. 3—Continued.

Framing Lumber—Continued.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
4*	2	6	16	64	Ribbon under hay-loft joists, notched 1" into studs.
8*	2	6	16	128	Spiked together to form 4 x 6 roof-plate on top of studs.
1	2	6	16	16	To cut short studs above upper doors of hay-loft.
56	2	6	14	784	Studs, side walls.
9	2	6	14	126	Posts under floor-beams, to cut 18 pieces 7' (3 pieces spiked together to form 6 x 6 posts).
3	2	6	14	42	Studs to small door openings.
4	2	6	12	48	Trimmings to door openings in hay-loft.
2	2	6	12	24	Trimmings to window openings in hay-loft.
112	2	6	12	1,344	All rafters, to cut 112 pieces 11' 9".
8	2	6	6	48	Rails to partitions to bull and cow pens.
2*	2	6	12	24	Treads to loft ladder, to cut 12 pieces 2'.
18	2	6	10	180	Stays to every third rafter from roof-plate to floor-joists.
14	2	6	10	140	Look-out rafters at eaves, to cut 56 pieces 2' 6".
8	2	6	10	80	Rails to partitions of bull and cow pens.
12	2	6	10	120	Uprights, to cut 24 pieces 5', for bull and cow pens.
8*	2	6	10	80	Spiked together to form 4 x 6 roof-plate on top of studs.
4	2	6	10	40	Studs, end walls.
4*	2	6	10	40	Ribbon under hay-loft joists, notched 1" into studs.
4	2	6	10	40	Braces across corners of hay-loft.
4	2	6	10	40	Uprights over mangers, to cut 12 pieces 3' 4", for bull and cow pens.
2	2	6	10	20	To cut short studs between upper and lower doors of hay-loft.
2	2	6	10	20	Sills to ventilator above roof.
2	2	6	10	20	Gate uprights, to cut 4 pieces 5'.
1	2	6	10	10	To cut headers for single doors.
19	2	6	8	152	Trimmings to windows.
6	2	6	8	48	2 pieces spiked together to form 4 x 6 gate and pen posts to bull and cow pens.

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

BILL OF MATERIAL, DAIRY BARN No. 3—Continued.

* *Framing Lumber*—Continued.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
	In.	In.	Ft.		
1	2	6	8	8	Rails, to cut 2 pieces 4', to bull-pen gates.
28	2	6	6	168	Collar-ties to roof.
1	2	6	6	6	Braces to gate.
1	1	12	16	16	Manger divisions to calf-pen, to cut 12 pieces 1' 2".
1	1	12	12	12	To cut manger ends.
2	1	10	12	20	Manger fronts to calf-pens.
2	1	10	6	10	Bull and cow pen mangers.
1	1	10	10	8	Bull and cow pen mangers, to cut 2 pieces 5'.
2	1	10	6	10	Manger fronts to calf-pens.
4	2	4	8	21	Rafters to ventilator-shaft roofs, to cut 12 pieces 2' 6".
26*	2	4	16	277	Mud-sills under plank floors.
1	2	4	16	11	Roof-plates to ventilator.
4	2	4	14	37	Head-rails to cow-stalls.
4	2	4	10	27	Locking-bars to loft doors.
8	2	4	10	53	Uprights on cow-stall manger fronts, to cut 16 pieces 5'.
8	2	4	8	43	Gate-post to calf-pen and gates at end of litter-alley; 2 pieces spiked together to form 4 x 4 gate-post.
16	2	4	8	85	Posts to stall divisions; 2 pieces spiked together to form 4 x 4 posts.
112	1	8	10	747	Braces on both sides of all rafters.
13	1	8	12	104	Cleats on both sides of roof-struts, to cut 104 pieces 1' 6".
8	1	6	4	16	Rails and braces to gates to pens.
1	1	6	14	7	Rails and braces to gates to pens, to cut 4 pieces 3' 6".
6	1	6	6	18	Rails and braces to gates to pens.
1	1	6	12	6	Rails and braces to gates to pens, to cut 1 piece 5' and 1 piece 6'.
8	1	6	10	40	Rails to calf-pen partitions.
1	1	6	10	5	Rail and brace to gate, to cut 2 pieces 5'.
9	1	6	8	36	Uprights to gates, to cut 18 pieces 4'.
8*	2	2	16	43	Corner framing to extract ventilator-shaft and hay-chute.
12*	2	2	8	32	Corner framing to extract ventilator-shafts and hay-chutes.
30*	2	2	20	200	Bridging to joists.
2	2	2	12	8	Framing to hay-chutes over feed-alleys.

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

BILL OF MATERIAL, DAIRY BARN No. 3—Continued.

Framing Lumber—Concluded.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
	In.	In.	Ft.		
2	2	2	12	8	Framing to bins.
2	2	2	10	7	Framing to hay-chutes over feed-alleys.
15	1	4	8	40	Uprights to calf stanchions, to cut 15 pieces 4' and 15 pieces 3' 6".
8	1	4	10	27	Uprights on cow-stall manger fronts, to cut 16 pieces 5'.
Total framing lumber				9,733	

Finish Lumber.

4	2	8	10	53	To cut 19 window-sills.
5	2	6	14	70	Rails to loft doors, to cut 20 pieces.
2	2	6	14	28	Braces to loft doors, to cut 4 pieces.
4	2	6	10	40	Braces to loft doors, to cut 8 pieces.
4	2	6	10	40	Stiles to loft doors.
12	2	6	8	96	Stiles to loft doors.
6	1	12	4	24	Fronts to fresh-air inlets.
19	1	10	4	63	Window-cheeks, to cut 38 pieces.
9	1	8	14	84	Window-frames for sashes, to cut 19 pieces.
4	1	8	16	43	Fascia at gables.
4	1	8	14	37	Fascia at gables.
3	1	8	14	28	Frames for single doors, to cut 6 pieces.
1	1	8	10	7	Frames for single doors, to cut 3 pieces.
9	1	8	12	72	Frieze to side walls.
4	1	8	8	21	Chutes to bins.
4	1	6	16	32	Corner-boards.
1	1	6	14	7	Braces to small doors.
2	1	6	8	8	Ledges to small doors, to cut 6 pieces 2' 6".
6	1	6	8	24	Sides to fresh-air inlets, to cut 12 pieces 4'.
4	1	6	16	32	Frieze at gables.
4	1	6	14	28	Frieze at gables.
1	1	6	8	4	Braces to outside door to litter-alley.
4	1	6	8	16	Chutes to bins.
4	1	6	4	8	Ledges to outside door to litter-alley.
2	1	5	16	13	Ridge cover-boards.
4	1	5	16	27	Corner-boards.
4	1	5	16	27	Door-casings to loft doors, to cut 8 uprights.
1	1	5	16	7	Door-casing heads to loft doors.
2	1	5	14	12	Ridge cover-boards.
3	1	5	14	18	Door-casings to single doors, to cut 6 uprights.

BILL OF MATERIAL, DAIRY BARN No. 3—Concluded.

Finish Lumber—Concluded.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
1	1	5	12	5	Head-casings to single doors, to cut 3 pieces.
2	1	5	10	8	Door-casing heads to loft doors.
2	1	4	16	11	Ridge cover-boards.
2	1	4	14	9	Ridge cover-boards.
19	1	4	8	51	Casings to 19 window openings.
Total finish lumber				1,053	

1,800 feet, board measure, 2" plank flooring for stalls, feed-alleys, and feed-space.

80 feet, board measure, 1" V-joint in 14' lengths for outside doors.

320 feet, board measure, 1" V-joint in 8' and 10' lengths for doors.

250 lineal feet 1 x 2 door and window stop.

3,600 feet, board measure, 1" shiplap for all outside walls.

1,300 feet, board measure, 1" shiplap for ventilator-shafts, hay-chutes, and feed-bins.

1,500 feet, board measure, 1" shiplap for lining inside walls of lower story.

3,000 feet, board measure, 1" shiplap or sawn boards for roof, laid close. (NOTE.—If open boarding is desired, 2,000 feet, board measure, will suffice.)

24 rolls of tar-paper.

28,000 British Columbia Red Cedar shingles (112 bundles).

2,000 feet, board measure, 1" T. and G. Fir or Larch flooring.

4,000 feet, board measure, siding.

19 4-light sashes, 8" x 10"; outside measurement 1' 8½" wide, 2' 1" high.

Hardware.

20 lb. 5" spikes.

175 lb. 4" common nails for framing.

180 lb. 2½" common nails for shiplap and roof-board.

120 lb. 2¼" flooring-nails for siding, flooring, and V-joint.

140 lb. 1¼" shingle-nails, zinc-clad, best-quality galvanized, or cut iron.

25 lb. 2" finishing-nails.

10 pairs 18" T-hinges for loft doors.

6 pairs 12" T-hinges for doors.

5 pairs 6" T-hinges for gates.

19 pairs 5" T-hinges for windows.

11 pairs 5" T-hinges for bin-lids, hay-chute door, and trap-doors.

19 window-catches.

3 barn-door latches.

5 8" barrel-bolts for gates.

1 5" hook and eye.

16 iron bars 2' long for cow-chains.

8 iron brackets for locking-bars to loft doors.

4 iron bolts, ½" x 6", for locking-bars.

4 iron bolts, $5/8$ " x 6", for door-bars.
 1 sliding iron bar, $3/8$ " x $1\frac{1}{4}$ " x 10', for calf stanchions.
 1 sliding iron bar, $3/8$ " x $1\frac{1}{4}$ " x 6', for calf stanchions.
 11 iron bolts, $3/8$ " x 2", for calf stanchion bar.
 11 iron bolts, $3/8$ " x 6", for calf stanchion bottom rail.
 2 iron rods, $5/8$ " x 30", ventilator damper pivots.
 58 lineal feet hay-fork carrier track and hangers for same.
 6 yards gravel for foundation.
 30 bags cement for foundation.

NOTE.—This bill of material includes everything necessary for the building itself, but does not include anything for scaffolding. Alternative quantities are given for two methods of roof-boarding—close and open—the choice being left to the builder. Close boarding is better where there is no hay-loft over the animals; where hay-lofts are shown open boarding will answer.

Dairy Barn No. 4.

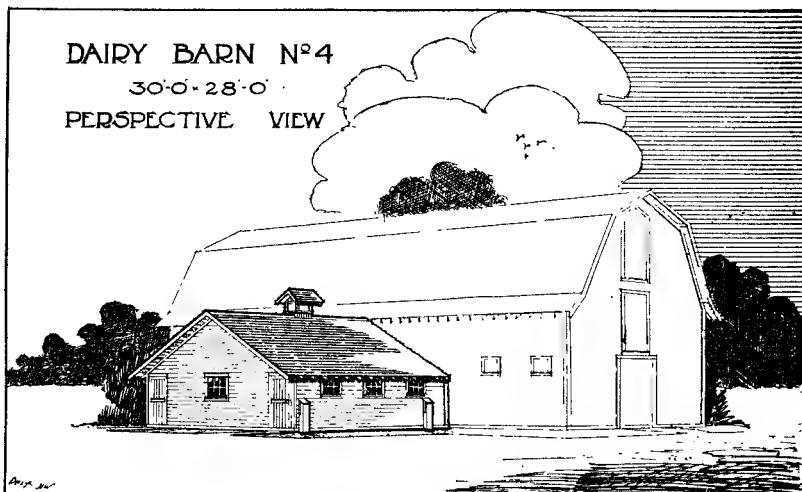


Fig. 10. A cheap, yet efficient dairy barn that can easily be built as an attachment to another barn. It is much better than a lean-to stable.

This is a very cheap yet efficient dairy-barn that can easily be built as an attachment to some other building already in use. Many farmers have barns of a more or less general-purpose type, but find that they are not well arranged for stabling dairy cows. They are just commencing perhaps, and do not wish to build an entirely new barn to house the ten or twelve dairy cows that comprise their herd. The building shown in this plan will meet all requirements of a dairy-stable. It can be extended to accommodate as many cows as required. The arrangement may vary, but in general the central feed-alley as shown in the plan will prove to be handiest, especially if a long stable is built.

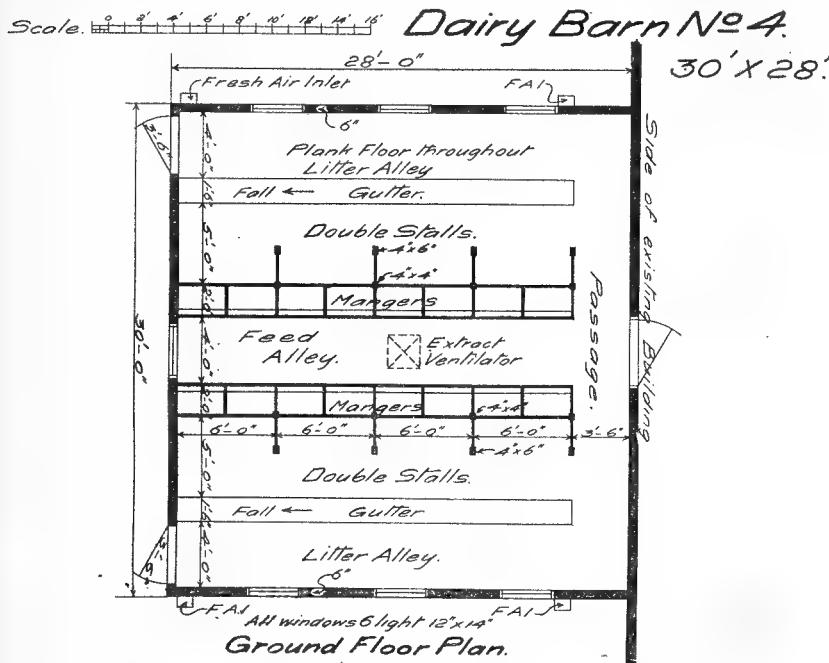


Fig. 11. Room for sixteen cows at a minimum of cost. The stable can be extended to accommodate as many cows as required.

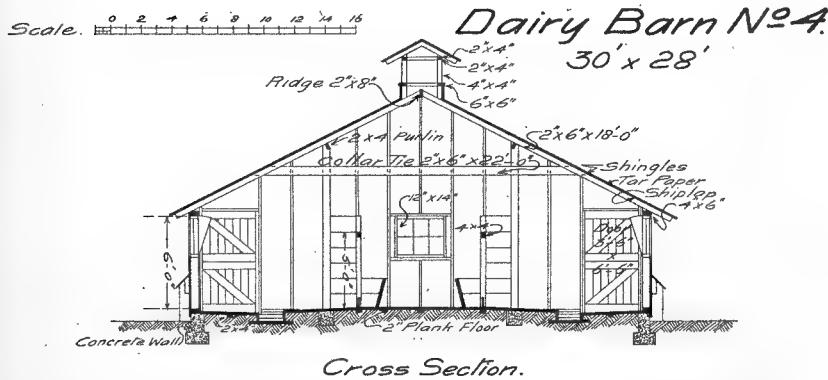


Fig. 12. This type of stable is very easy to ventilate.

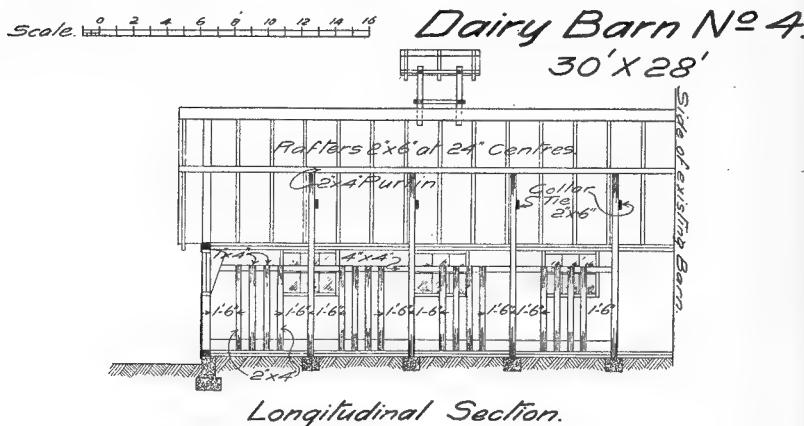


Fig. 13. Note the very simple construction of the frame and also of the mangers.

The feed, of course, must be housed in the larger building to which the stable is attached. This kind of stable is one of the easiest to ventilate perfectly, and as that is of first importance in a dairy-barn, the use of this type is to be advocated in preference to the lean-to stables where the cows stand in a single row facing the main building. These latter are hard to light, have also the tendency to make the barns to which they are attached dark, are unhandy, and it is impossible to ventilate them perfectly.

BILL OF MATERIAL, DAIRY BARN NO. 4.

Framing Lumber.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
	In.	In.	Ft.		
28	2	12	8	448	Plank floors to litter-alley, to cut 56 pieces 4'.
25	2	12	10	500	Plank floors to stalls, to cut 50 pieces 5'.
28	2	12	8	448	Plank floors to feed-alley.
4	2	12	14	112	Plank floor to passage at ends of stalls, to cut 8 pieces 6' 6".
8	2	12	12	192	Manger fronts next feed-alley.
16	2	12	8	256	Short lengths for stall and manger divisions.

BILL OF MATERIAL, DAIRY BARN NO. 4—Continued.

Framing Lumber—Concluded.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
	In.	In.	Ft.		
4	2	10	12	80	Plank gutters.
1	2	8	14	19	Ridge.
1	2	8	16	21	Ridge.
8	2	8	6	64	Manger fronts.
4*	2	6	14	56	Sills on foundation-walls.
2*	2	6	16	32	Sills on foundation-walls.
4	2	6	12	48	Sides of gutter next to stalls.
30	2	6	6	180	Studs, side walls.
2	2	6	12	24	Studs under windows.
2	2	6	12	24	Trimmings under windows, to cut 6 pieces 3' 6".
4	2	6	10	40	Studs, end wall.
3	2	6	12	36	Studs, end wall.
4	2	6	14	56	Studs, end wall.
2	2	6	8	16	Studs, end wall.
1	2	6	16	16	Trimming around window on end wall.
32	2	6	18	576	Rafters.
4	2	6	22	88	Collar-ties.
4*	2	6	14	56	Roof-plate, doubled to form 4 x 6.
4*	2	6	16	64	Roof-plate, doubled to form 4 x 6.
1	2	6	8	8	Trimming over doors.
16	2	6	12	192	Doubled to form 4 x 6 posts under roof-purlins at ends of stall divisions.
1	2	6	12	12	Sill to ventilator above roof.
10	2	4	14	93	Bearers under plank floor.
2	2	4	14	19	Purlins under rafters.
2	2	4	16	21	Purlins under rafters.
16	2	4	6	64	Doubled to form 4 x 4 posts at manger fronts.
16	2	4	6	64	Doubled to form 4 x 4 head-rail.
8	2	4	8	43	Doubled to form 4 x 4 posts to ventilator.
1	2	4	12	8	Roof-plate to ventilator.
1	2	4	16	11	Rafters to ventilator roof.
8	2	4	10	53	Uprights to mangers next feeding openings, to cut 16 pieces 5'.
2	1	12	12	24	Cut into short lengths to divide mangers between each pair of cows.
8	1	4	10	27	Uprights to mangers between feed openings.
4	2	2	12	16	Sides of gutter next feed-alley.
Total framing lumber				4,107	

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

BILL OF MATERIAL, DAIRY BARN No. 4—*Concluded.**Finish Lumber.*

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
2	2	8	14	37	Window-sills, to cut 6 pieces 4' 8".
1	2	8	6	8	Window-sill, to cut 1 piece 4' 8".
2	1	10	10	17	Fronts and roof of inlet ventilators.
7	1	10	6	35	Side cheeks to windows, to cut 14 pieces 2' 6".
4	1	8	16	43	Frieze at eaves.
3	1	8	14	28	Door-frame sides, to cut 6 pieces 6' 6".
1	1	8	12	8	Door-frame heads, to cut 3 pieces 3' 8".
3	1	8	10	20	Window-frame sides, to cut 12 pieces 2' 6".
1	1	8	6	4	Window-frame sides, to cut 2 pieces 2' 6".
2	1	8	12	16	Window-frame heads, to cut 7 pieces 4'.
1	1	8	4	3	
2	1	8	18	24	Fascia at gables.
2	1	6	18	18	Trim at gable ends.
3	1	6	14	21	Rails to doors, to cut 12 pieces 3' 6".
3	1	6	8	12	Braces to doors, to cut 6 pieces 4'.
4	1	6	8	16	Sides to inlet ventilators, to cut 8 pieces 4'
1	1	5	14	6	Heads to door-casings, to cut 3 pieces 4' 4".
3	1	5	14	18	Door-casing, to cut 6 pieces 7'.
2	1	5	16	13	Ridge cover-boards.
3	1	4	10	10	Side casings to windows, to cut 12 pieces 2' 6".
1	1	4	6	2	Side casings to windows, to cut 2 pieces 2' 6".
2	1	4	16	11	Ridge cover-boards.
12*	1	2	16	32	Door and window stops.
1*	1	2	8	1	Door and window stops.
Total finish lumber				403	

* **Random lengths** to make up the same total number of lineal feet will answer for these items, and are cheaper to buy than specified lengths.

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

2,200 feet, board measure, shiplap for roof-boarding and outside of walls.

2,000 feet, board measure, shiplap lining to walls and under-side of rafters.

120 feet, board measure, 1" V-joint for doors.

10,500 British Columbia Red Cedar shingles (42 bundles).

1,050 feet, board measure, drop-siding.

6 rolls tar-paper.

Hardware.

- 40 lineal feet sheet-metal flashing 14" wide at junction of barn roof and wall of existing barn.
- 7 6-light sashes, 12" x 14"; outside size 3' 4½" wide by 2' 9" high.
- 6 pairs 8" T-hinges for doors.
- 3 4" hooks and eyes for lower doors.
- 3 barn-door latches for upper doors.
- 7 pairs 4" T-hinges for windows.
- 7 spring-bolt fasteners to windows.
- 52 lb. 1¼" shingle-nails, galvanized, zinc-clad, or cut iron.
- 80 lb. 2½" common nails for shiplap.
- 20 lb. 2¼" flooring-nails for siding.
- 50 lb. 3½" common nails for plank floor.
- 80 lb. 4" common nails for framing.
- 10 lb. 2" finishing-nails.
- 8 yards of gravel for foundation.
- 40 bags cement for foundation.

Roof Framing.

Fig. 14 illustrates roof framing suitable for barns from 32 to 40 feet wide. The roofs shown are economical in material, simple in construction, and strong, and supporting posts are unnecessary, thus allowing a clear storage-space in the haymow.

The illustrations give the lengths and sizes of the various roof timbers. It will be noticed that no timber is longer than 16 feet, or of greater size than 2 x 6 inches (except the short 2- x 8-inch struts).

One complete set of timbers for the roof should first be laid out on the hay-loft floor, and all joints very carefully marked and cut. This complete set should then be used as a pattern for all the other roof timbers, which should be cut and stacked in piles before any are erected. In cutting off lengths of rafters, etc., in order to have all lengths accurate, always work to the pattern and not to the last piece cut.

*Mangers and Stalls.**COW STALLS.*

Fig. 15 illustrates a good type of single cow-stall, simple in design and easy to build. The stall divisions are made of 2-inch planks, with 1- x 4-inch cleats on both sides; they will be found to leave ample room for the milker and at the same time are wide enough to prevent the cows from crowding or hooking each other. The life-up manger is very convenient in allowing easy and thorough cleansing of the floor forming the manger bottom.

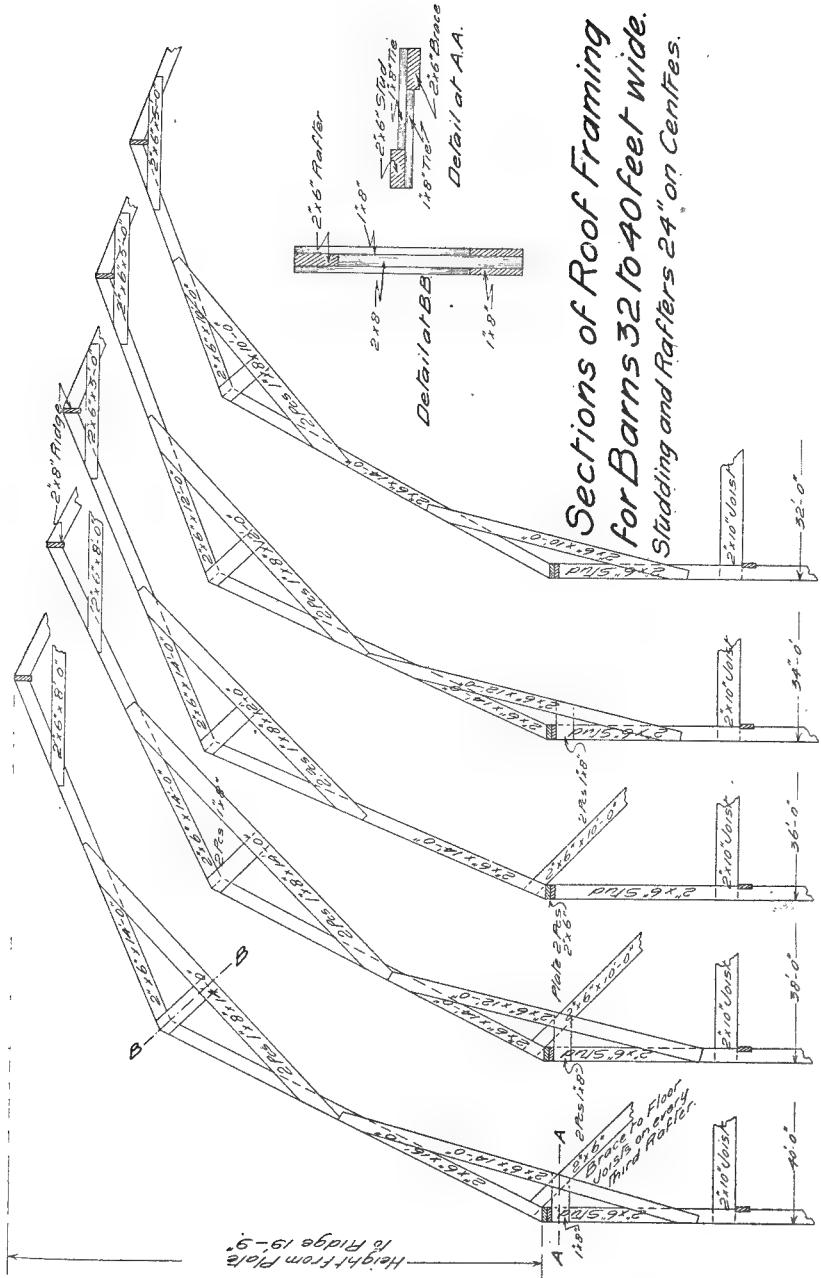


Fig. 14. Roofs that give lots of storage-room and are simple, cheap, and strong. No timber is longer than 16 feet or larger than 2 x 8 inches.

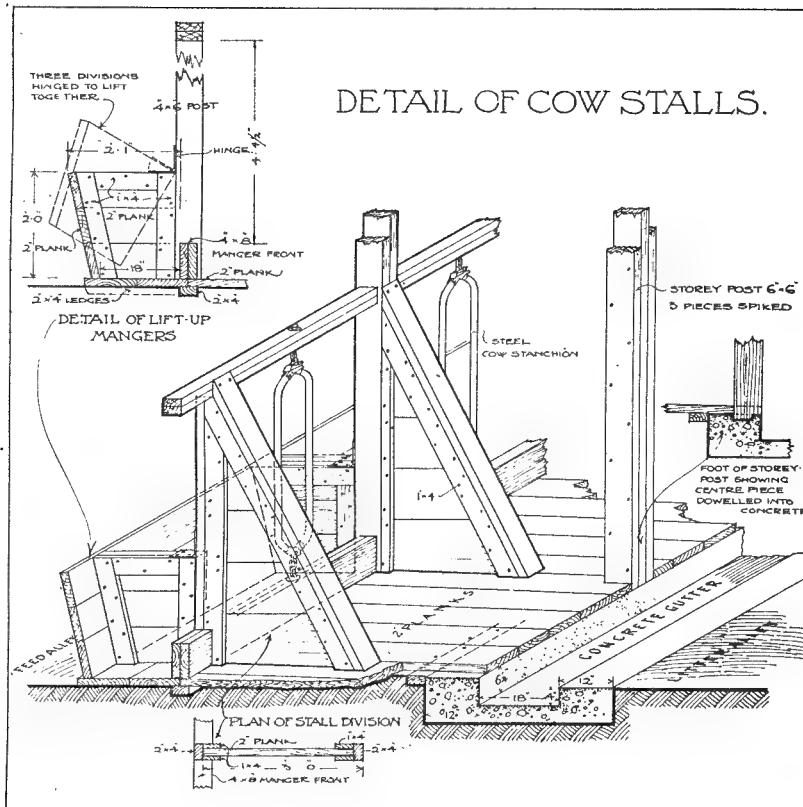


Fig. 15. A simple and serviceable single stall. The lift-up manger makes thorough cleansing easy.

CATTLE MANGERS.

In Fig. 16 three types of cattle mangers are shown, and also one type of stall division for cows stabled in pairs.

No. 1 is a fixed or stationary manger for a box stall and is especially suitable for bulls and steers. It is partly in the stall and partly in the feed-alley, thus making it easy to put in feed from the alley without entering the stall. The partition or rail which comes down below the level of the manger top holds the roughage in place and prevents the animal from throwing it out. The manger is of good size; in fact, three or four yearlings could feed out of it together.

Manger No. 2 is also intended for box stalls. It is known as a tilting manger, and is hinged at the bottom so that it can be drawn

forward for putting in the feed; it drops back into position by its own weight. It is necessarily shallow and rather wasteful of feed, as there is nothing to prevent the animals from pushing the roughage out on to the floor. It is intended for use only where the feeding-alley is so narrow that a projecting manger like No. 1, which is in general a more satisfactory type, would be in the way.

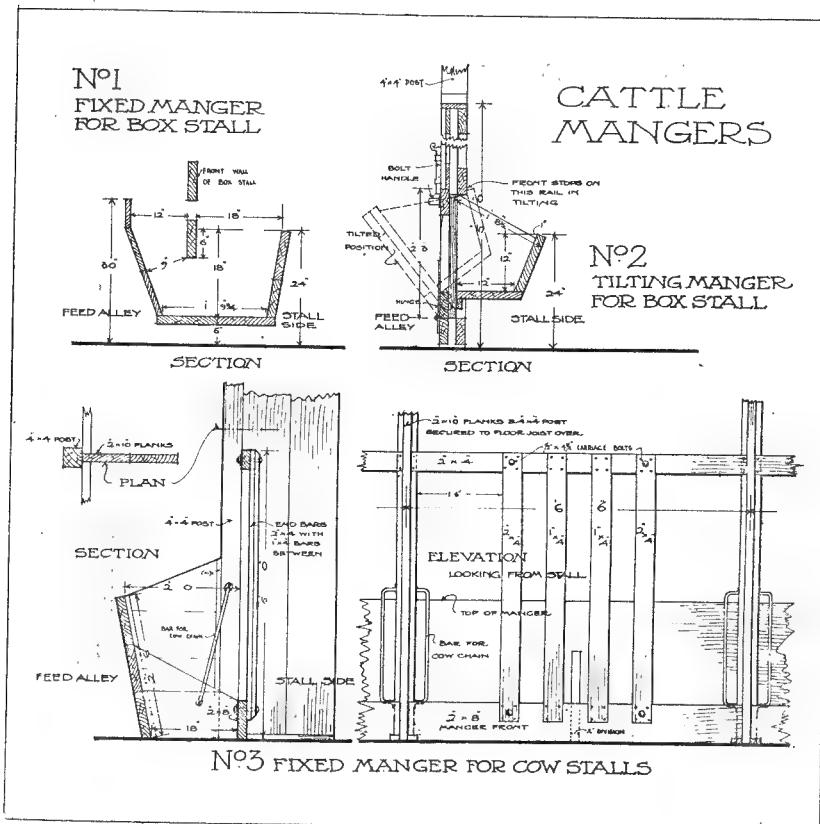


Fig. 16. Mangers that are easy to make and convenient to use.

No. 3 is a type of fixed manger suitable for double stalls. The manger itself is simple in construction, the main features being the method of tying and the divisions between the stalls. The iron bar to which the cow's chain is attached is fixed slantwise to the side of the stall and manger partition, the lower end of the bar being placed

some 6 inches farther forward than the top. This helps to keep the cow clean, because, as she lies down, the chain naturally drops downward and forward and draws her well up towards the manger and away from the gutter.

The narrow division between the stalls is made of two planks fixed upright from floor to ceiling. It extends back from the manger plenty far enough to prevent the cows from hooking each other, but not far enough to be in the way of the cows when lying down or of the attendants when milking.

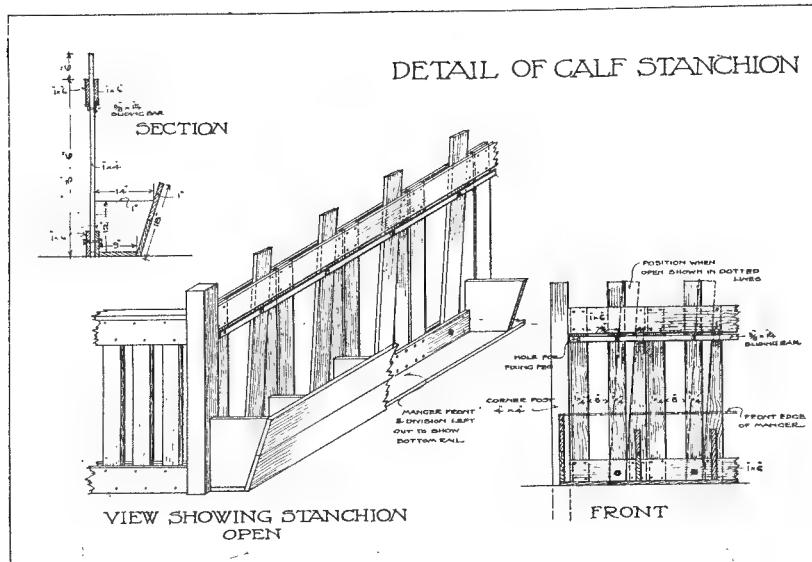


Fig. 17. Intended to hold the calves while they are being fed.

CALF STANCHION.

Fig. 17 illustrates a simple stanchion of the rigid type. It is intended for use only while the calves are fed, and for a short time afterwards to prevent them from forming the habit of sucking each other's ears, which often occurs when they feed in loose pens. The stanchion and manger are all made from 1-inch boards. The pivoted uprights are operated by a straight iron bar, the position and fixing of which is clearly shown in the illustration.

Barn Ventilation.

Fresh air ranks with sunlight as one of the prime necessities in any building used for the housing of live stock. Too much stress cannot be laid upon this point. Foul air is certain to cause disease. A stable lacking proper ventilation is neither sanitary nor comfortable. Low temperature does not mean pure air, and the purity of the air in a stable cannot be judged by its temperature.

The necessary conditions in a good ventilation system are: (1.) No animal should be in a direct draught. (2.) Each animal should get a sufficient amount of fresh air; no animal should be in a corner or a space where the fresh air does not circulate and from which the foul air is not carried off. (3.) The currents of air should all be in the one direction—that is, away from the cold walls and towards the outlets. (4.) The ventilators should be easily controlled, so that in extremely cold weather the temperature need not be unduly lowered.

The Rutherford system of ventilation is used in all the barns shown in this bulletin. It is one of the best in use and is recommended by most authorities in Canada. In this system the fresh air is brought in through a number of small openings or ducts at the bottom of the outside walls, so distributed that fresh air is diffused throughout all parts of the stable. These ducts are generally raised up inside to about 8 inches above the floor, so that cold draughts will not run along the floor. As it is used and becomes warmed the air moves gradually to the centre of the building and up to the ceiling and out through the outlets. There should be no cross-current nor any tendency to bring air once breathed and warmed in contact with the outside wall. Usually about one outlet is provided for every four inlets.

Where the mangers are against the wall it is difficult to introduce the air without causing a draught on the animals. In an experiment carried on at the Central Experimental Farm, Ottawa, to avoid this difficulty the fresh air was carried underneath the floor to the back of the stall. Where this is done care must be taken to have the air-shaft absolutely water-tight. This can be ensured by using vitreous tile pipe with cemented joints. If the air is brought in at the manger it should be broken up into very small openings (auger-holes), so as not to create a draught. If there is a feed-passage along the wall it makes an excellent place for bringing in the fresh air.

The air should be brought in through small openings and at frequent intervals. An opening should not be larger than 6 x 8 inches. Six- or four-inch tile pipes make good ducts. Eight square inches of inlet should be allowed for each cow two years old and over, and 10 to 12 square inches for each horse. The inlets should be placed along the walls, so that they will distribute the fresh air as far as possible throughout the entire stable. The inlets on the outside of the walls should be carried up high enough to be above the snow-line and also to prevent dust and rubbish from blowing into them. The openings should be on the side walls of the inlet and not the face, so that strong winds will not blow directly into them and affect the ventilation within the barn. Fly-screens should be put over the openings.

The currents of air should be all in one direction—that is, towards the outlets. The air breathed out by animals is heavily laden with moisture. If this moisture-laden air is kept too long in contact with a cold wall or ceiling surface the moisture will be deposited in the form of hoar-frost, and the next mild day the walls will begin to drip. There is nothing so uncomfortable as a wet barn. When an animal gets its coat wet it has to supply sufficient animal heat to evaporate the moisture. That this waste of heat—or, in other words, food—is considerable is shown by the fact that it takes five and one-third times as much heat to evaporate water as it does to bring it from the freezing to the boiling point. In this connection the construction of the walls is very important. Unless they have some form of insulation such as a dead-air space, it is impossible to keep them dry, except by lowering the inside temperature to approximately the same as the outside. Double walls with a dead-air space between will keep dry if there is a good circulation of air in the stable. No system of ventilation will keep solid stone or cement walls dry—especially in very cold weather—unless they are wood lined. (See Bulletin 78, Department of Agriculture, Ottawa.)

The outlets should be not less than 16 inches in diameter, and 24 inches is preferable. About 20 square inches of outlet space should be allowed for each animal. The outlets should be located as near the centre of the barn as possible. They should be built of two-ply lumber with tar-paper between, to make them as air-tight and as warm as possible. The air that is carried up the outlets is full of moisture, and if the outlet is cold it will soon collect a lot of hoar-frost. The

outlet should be built with as few angles as possible and be carried above the ridge in the form of a cupola. In the cupola it is preferable to have the sides open rather than covered with slats. If the roof is carried well over the walls there is not much danger of the snow and rain beating in the open sides.

The ventilation system should be easily controlled. The higher the ventilator is carried, the greater the amount of air it will take out of the barn. Also the greater the difference in the temperatures between the inside of the stable and the outside, the more air will be carried off. Consequently it is necessary to control the outlets with a damper, the controlling cords of which should be brought down into the stable for convenience. The exact amount of opening for different weather conditions is soon learned, and it is only a minute's job to adjust two or three ventilators before leaving for the night.

No ventilating system is automatic for all conditions of wind and temperature, but the Rutherford system can be operated with a minimum of attention and has proved to be most successful for conditions in the West.

ICE AND MILK HOUSES.

Ice on the Farm.

The preservation of milk in its natural state for any length of time requires that immediately after milking it be cooled to and kept at a low temperature—50 degrees or less. This means that ice must be used. Cooling by water alone, even where the water is running or is changed frequently, is not sufficient to preserve milk through twenty-four hours or more in hot weather. Yet it is generally necessary to keep milk or cream that long, and often longer, as, for example, where it is sold to a creamery or cheese-factory and must be kept from Saturday till Monday each week.

Ice makes it possible also to keep many other farm products in a good state of preservation during the hot summer months. Vegetables, fresh meats, and eggs can be kept fresh much longer with ice than where no ice is available. The main reason why so many of the country eggs grade low and sell for a correspondingly low price is that they are not properly cared for before they leave the farm. In hot weather fertile eggs begin to hatch almost as soon as they are laid. Eggs should be collected regularly and kept in a cellar or cold storage of some kind until sold. They will then be much superior to the ordinary run of eggs not so kept and will command a correspondingly higher price.

Natural ice is available in winter to nearly every farmer. It is to be found in abundance in all of our rivers and lakes. It is free to all, the cost depending entirely upon the outlay in time and labour required in cutting, hauling, and storing it. Tools for handling ice are simple and cheap—a crosscut saw and a pair of ice-tongs being all that are required. The storage is not difficult. The blocks of ice are simply piled up in a mass as compactly as possible, with a foot or two of dry sawdust or prairie-hay all around it on the outside—sides, top, and bottom.

In every case the ice must be provided with drainage underneath and some sort of shelter and ventilation above. Any kind of rough building or shack will do for a shelter over the ice, provided it is reasonably weather-proof. A permanent building part of which can

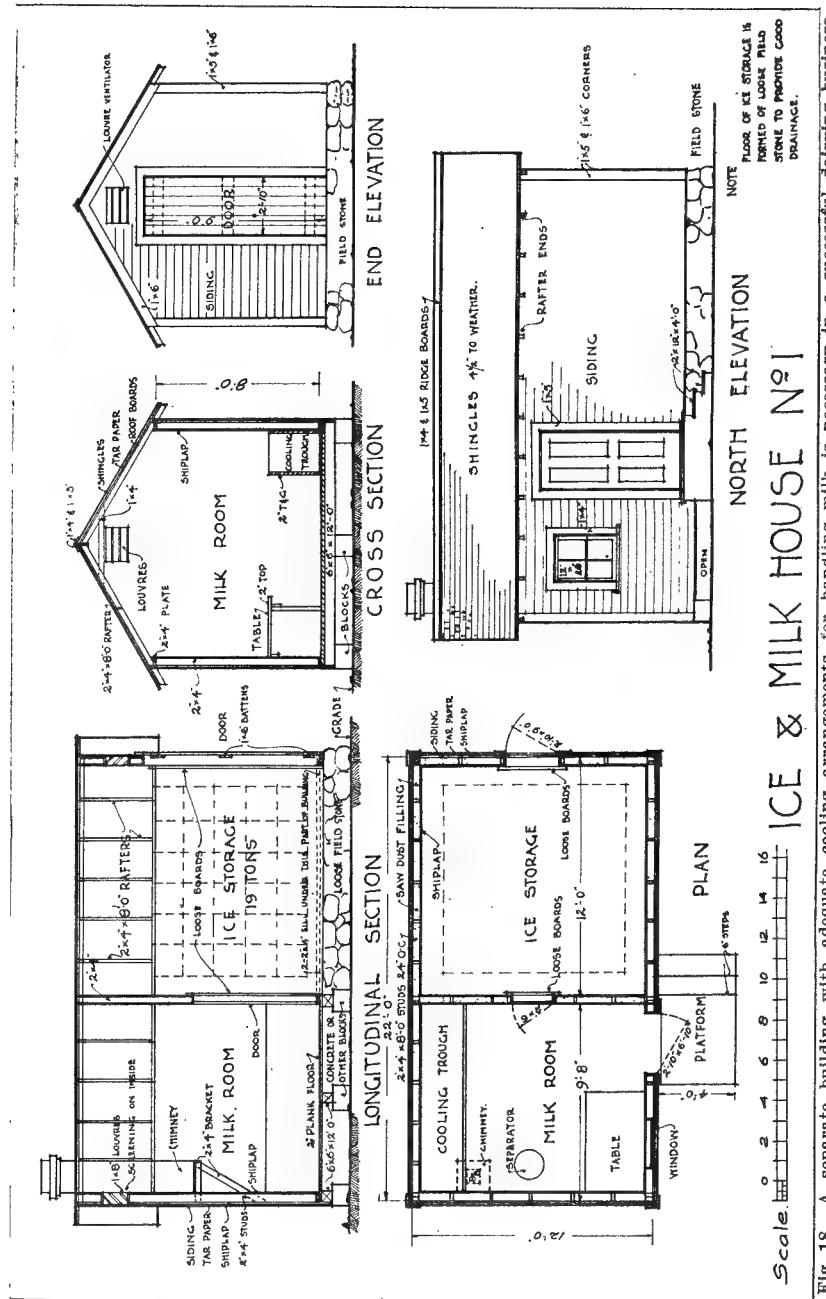


Fig. 18. A separate building with adequate cooling arrangements for handling milk is necessary in a successful dairying business.

be used for ice-storage and part for a milk-room is, however, much more useful and better looking than a shack for ice alone, and most farmers find it desirable sooner or later to have one. Two inexpensive and suitable ice and milk houses, differing chiefly in the method of ice-storage used, are shown in this bulletin. For those living close to a natural supply, House No. 1 will probably be most satisfactory; but any one situated where the supply of natural ice is limited could use House No. 2 to advantage.

Ice and Milk House No. 1.

The house, as the plan shows, is divided into two rooms. In one room ice is stored in the form of blocks, covered by sawdust or hay, and is taken out as needed for use in the cooling-trough in the milk-room and for the cold box or refrigerator in the farm-house. In the other room the milk is separated and cooled directly after milking.

This arrangement is one of the most popular and convenient in use. It has an advantage over the pit type used in House No. 2, in that the ice can be used in the residence or elsewhere. The disadvantages are that more ice is needed because there is greater waste, and also there is more work in handling the ice.

Foundation.—The building rests on foundation-blocks of stone or concrete. Under the ice-room drainage is provided by loose stone covered with gravel or cinders. It is a good plan to put a drain of tiles, or of poles and loose stone, under the middle of the building to drain the two rooms.

Walls.—The walls and the partition between the two rooms are double throughout to prevent heat or cold from passing through, thus keeping the interior as cool as possible. A filling of dry sawdust is put between the double walls of the ice-room as a further insulation. The house should be banked up outside above the sill with earth, sawdust, or straw to keep the warm air out in summer.

Ventilation.—At each end of the gable and also through the middle partition are openings for ventilation. Those at the ends of the building are fitted with louvre-boards. Ventilation is necessary to keep the interior dry.

Milk-room.—This contains the cooling trough or tank, the milk-separator, a table, and such shelves, racks, etc., as are necessary. Water and ice are kept in the cooling-trough and the cans of milk are set in this for cooling. The trough should have an outlet in the bottom

into the main drain underneath the building. The floor of the milk-room may be built of either concrete or plank, as desired. The plan shows 2-inch plank, which should be of Douglas Fir or Western Larch, both woods being highly resistant to water-soakage and to wear. If the floor is built with a slight slope from each side towards the centre it is easier to keep clean and dry. In any case, it should be provided with a drain. The platform at the front, on a level with the floor of the milk-room, is convenient for loading and unloading milk-cans.

Ice-room.—The average farm would need from 10 to 20 tons of ice per summer, including waste. One ton of solid ice occupies approximately 35 cubic feet, so that the space required for its storage is comparatively small. For example, a solid block of ice 7 feet square and 7 feet high weighs about 10 tons. This would allow a daily consumption, if there were no waste, of nearly 3 cubic feet, or over 160 lb. daily for four months (1 cubic foot weighs $57\frac{1}{2}$ lb.). A considerably larger storage-space than the actual bulk of the ice is, of course, needed to allow for waste and for the covering of sawdust.

The ice-room in House No. 1 is nearly 12 feet square and is 8 feet high from floor to eaves. This gives ample space for 19 to 20 tons. No floor is required in the ice-room. A coating of sawdust over the cinders, gravel, or loose stones is sufficient to ensure the ice against thawing from the bottom, and at the same time provides good drainage.

There are two doors, one opening outside through which the room is filled; the other opening into the milk-room. On the inside wall of each doorway is a second door of short, loose boards laid on edge one above the other and held loosely by an upright on each side of the doorway. These boards are slipped into place as the room is filled and removed as it is emptied. After the ice-house is filled the space between the loose boards and the closed door should be filled with either sawdust or hay. This can easily be done from the top of the ice after the outside door has been sealed up.

Filling the Ice-room.—It will usually be found most convenient to haul all of the ice required while the sleighing is good, if possible, and dump it on the ground adjacent to the door of the ice-house. It will not waste any and the actual filling can be done later. A skidway made of some old plank, a pulley fastened to the ridge at the far end of the ice-house on the inside, and 50 or 60 feet of rope is all the tackle required. A horse is hitched to one end of the rope, the other end is

run through the pulley and back to the outside, where it is fastened to a block of ice. This method saves a great deal of very heavy work, as the largest blocks can be easily handled in this way, and by simply raising the skidway as required the ice-house can be filled clear to the top.

The gravel or cinder floor should first be covered with a foot of dry sawdust or hay. The ice is then piled directly on top of the sawdust, leaving a space of at least a foot between the ice and the walls. The ice blocks should be packed together as closely as possible, and crushed ice or snow rammed in the spaces between them. The ice will then freeze together in a solid mass, with a minimum of surface exposed to melting. Sawdust or hay should never be placed between the blocks or tiers. The space of a foot or more between the ice and the walls should be filled with dry sawdust, free from ice or snow. If sawdust cannot be obtained, well-packed prairie-hay, cut straw, or chaff may be used instead. In this case a double thickness—that is, 2 feet—would be needed to equal the insulation given by a foot of sawdust. The top of the ice should be covered with 2 feet of sawdust or hay. A foot of sawdust would do, but it is desirable to have some extra to fill in the side packing when it settles in the spring.

BILL OF MATERIAL, ICE AND MILK HOUSE No. 1.

Framing Lumber.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
3	In.	In.	Ft.		
3	4	6	12	72	Sill pieces laid level on concrete or other blocking under floor of milk-room.
24	2	6	10	240	2" plank floor laid on 4 x 6 sills.
1	2	6	14	14	Ridge.
1	2	6	12	12	Ridge.
2	2	4	16	21	2 x 4 sills on top of 2" plank floor to milk-room, and doubled to form 4 x 4 sills on stone foundation to ice-storage.
1	2	4	14	9	
6	2	4	12	48	
30	2	4	8	160	Studs to side walls.
1	2	4	12	8	Studs to end walls and cross-wall between milk-room and ice-storage.
5	2	4	10	33	
8	2	4	12	64	Studs to end walls and cross-wall between milk-room and ice-storage, to cut 2 pieces 11' 9", 2 pieces 11' 6", and 4 pieces 11'.

BILL OF MATERIAL, ICE AND MILK HOUSE No. 1—Continued.

Framing Lumber—Concluded.

No. of Pcs.	Thick. •	Wide.	Long.	Feet Board Measure.	Used for.
1	2	4	16	11	Studs to cross-wall between milk-room and ice-house, to cut 1 piece 10' and 1 piece 6'.
4	2	4	12	32	Roof-plate.
28	2	4	8	159	Rafters.
1	2	4	14	9	Door and window headers, to cut 2 pieces 3', 2 pieces 2' 6", and 1 piece 2'.
1	2	4	16	11	Rails and bearers under table-top, to cut 2 pieces 5' and 2 pieces 3'.
1	2	4	6	4	Table-legs, to cut 2 pieces 2' 4".
Total framing lumber			907		

Finish Lumber.

1	2	12	16	32	2" table-top.
6	2	10	10	100	2" tongued and grooved front and back to cooling-trough, to cut 6 pieces 9' 8".
1	2	10	12	20	2" tongued and grooved for ends of cooling-trough, to cut 6 pieces 2'.
3	2	8	10	40	2" tongued and grooved for bottom of cooling-trough, to cut 3 pieces 9' 8".
1	2	8	4	5	Window-sill.
5	1	10	6	25	Movable boards behind outside door to ice-storage, to cut 10 pieces 3'.
2	1	10	10	17	Movable boards behind door between milk-room and ice-room, to cut 10 pieces 2'.
1	1	8	12	8	Louvres to ventilators, to cut 6 pieces 2'.
4	1	6	10	20	Corner-boards.
2	1	6	16	16	Roof-trim in gables.
3	1	6	16	24	Cut into short lengths for rails and braces to doors.
3	1	6	16	24	Lining to door openings.
1	1	6	12	6	Lining to door openings.
1	1	6	12	6	Frame around window opening.
1	1	6	14	7	Louvre-frames, to cut 4 pieces 2' and 4 pieces 1' 4".
1	1	5	16	7	Ridge cover-boards.
1	1	5	8	3	Ridge cover-boards.
1	1	5	16	7	Door-casing, to cut 2 pieces 7' 6".
2	1	5	10	9	Door-casing.
4	1	5	10	17	Corner-boards.
1	1	5	10	4	Door and window casing, to cut 3 pieces 3' 2".

BILL OF MATERIAL, ICE AND MILK HOUSE No. 1—*Concluded.**Finish Lumber*—Concluded.

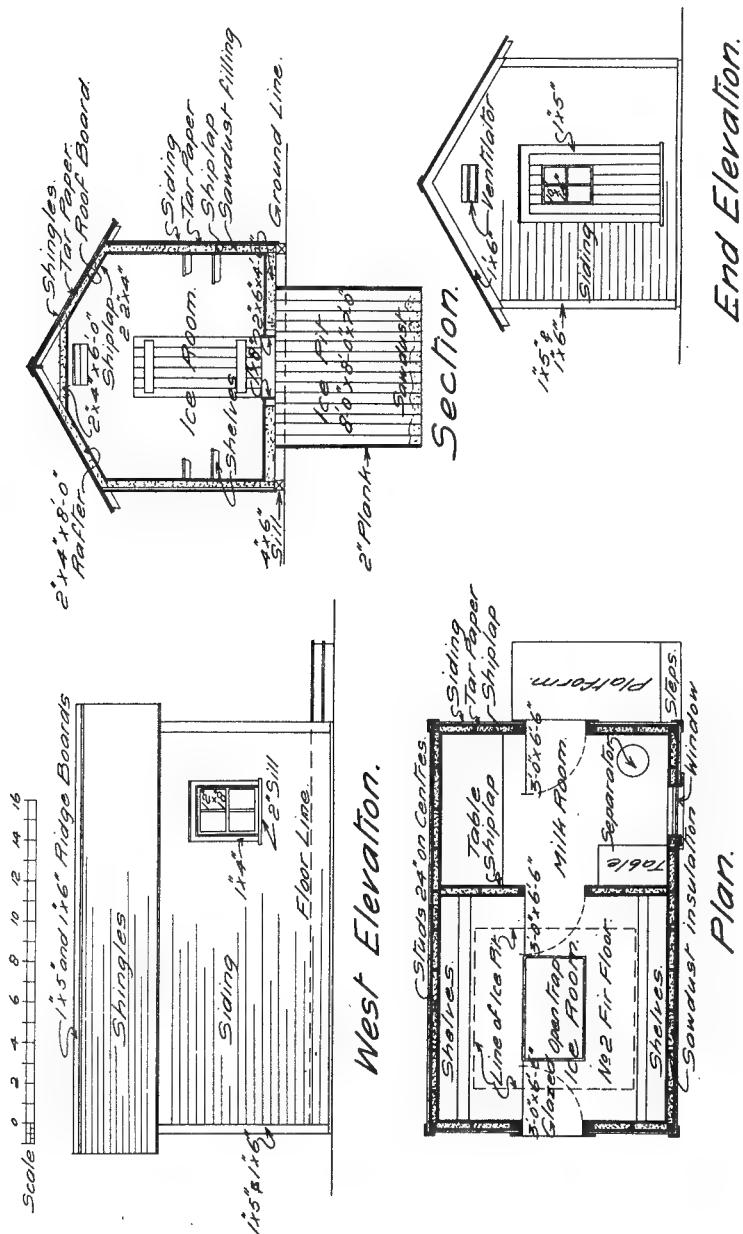
No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
1	1	5	8	3	Door and window casing, to cut 2 pieces 4'.
1	1	4	16	5	Ridge cover-boards.
1	1	4	8	3	Ridge cover-boards.
3	1	2	16	8	Door-stops.
1	1	2	12	2	Door-stops.
4	1	2	10	7	Fixed to form groove for movable
2	1	2	16	5	boards to slide in.
1	1	2	14	2	Stop to sash.
Total finish lumber				432	

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

- 1,250 feet, board measure, 1" Red Cedar shiplap in 12' lengths for inside walls and under-side of rafters.
- 360 feet, board measure, Red Cedar shiplap in 10' lengths for inside lining.
- 450 feet, board measure, 1" Red Cedar shiplap in 16' lengths for lining on outside of studs.
- 80 feet, board measure, 1" V-joint for doors.
- 400 feet, board measure, 1" sawn roof-board or shiplap.
- 800 feet, board measure, drop-siding.
- 3,250 British Columbia Red Cedar shingles (13 bundles).
- 90 bushels of sawdust for filling in to all walls and rafters.
- 5 rolls of tar-paper to roof and outside walls.
- 1 4-light sash, 12" x 16"; outside measurement 2' 4½" wide by 3' 1" high.

Hardware.

- 18 lb. 1¼" shingle-nails, zinc-clad, best-quality galvanized, or cut iron.
- 60 lb. 2½" common nails.
- 10 lb. 2" finish-nails.
- 15 lb. 3½" common nails.
- 25 lb. 4" common nails.
- 1 piece insect-screen for outside of window, 2' 6" x 3' 3".
- 2 pieces insect-screen, 12" x 24", for ventilators.
- 1 pair 3" butt-hinges for window.
- 1 spring-bolt for window fastening.
- 2 12" lengths of small chain for window when open.
- 3 pairs 8" T-hinges for doors.
- 3 door-latches.
- 8 cubic yards of rough field-stone.



Ice and Milk House № 2.

Ice and Milk House No. 2.

This differs from House No. 1 mainly in that the ice is frozen in place during winter in a pit dug underneath the ice-room, and this pit itself is used for the cooling-tank in summer. The chief advantages over the other house are that no handling of the ice is necessary; there is less waste and therefore less ice is required; and the ice-room makes an excellent cold-storage place for foodstuffs instead of being filled up with ice. The disadvantages are that the ice is not in convenient form to take out for use in the farm-house; the digging of the pit means extra work in construction; and extra work is entailed each year in filling the pit with water, though this is perhaps no greater than the hauling of ice from the river.

The Ice-pit.—This, of course, should be dug before the building is erected. The size specified—8 x 8 x 7 feet—will contain over 12 tons of ice, and if the building is well constructed and banked, only the upper part of it will melt out during a summer. The sides are stayed or cribbed with 2-inch plank (Douglas Fir, Western Larch, or Red Cedar preferably) to prevent the earth from falling in when the top ice melts in summer. The plank should be upright and should extend from the bottom of the pit up above the surface of the ground to the bottom of the floor. A layer of sawdust about 6 inches deep should be put on the bottom of the pit.

The pit should be filled gradually during cold weather in winter, the outside door of the ice-room being left open to facilitate the freezing. First of all, water should be thrown over the bottom and sides to freeze and form a water-proof coating of ice. The pit should then be filled about 6 inches at a time, each layer being allowed to freeze before the next one is put in. If the whole pit is filled at once it will not freeze as rapidly or as solidly, and, moreover, is apt to damage the pit by the expansion which takes place when water turns to ice. If water in sufficient quantity is difficult to obtain, the pit may be filled with ice cut from a slough or lake. The best way to do this is to fill the pit about one-third full of ice, then pour in a few barrels of water, enough to fill up the crevices between the blocks of ice, so that when frozen it will form a solid mass. As soon as this layer is frozen solid the next may be put in, and so on until the pit is full. This will prove to be a quicker method as a rule than where water only is used.

Foundation and Walls.—The foundation of House No. 2 may be of Western Red Cedar, creosoted Douglas Fir, creosoted Western Larch, stone or concrete. The walls and ventilation are like those of House No. 1, and the house should be similarly banked outside.

Milk-room.—This is similar to that of House No. 1, except that it contains no cooling-trough, the extra space being occupied by a table, can-racks, and shelves.

Ice-room.—There are two doors in the ice-room, one leading to the milk-room and one outside. These should be preferably double doors to keep the ice-room as cool as possible. The door leading outside should be used only in winter, when it is left open for carrying water to the ice-pit and for freezing water. During the rest of the year it should be battened up to help keep the interior cool.

The floor of the ice-room is on the same level and may be continuous with that of the milk-room, and like it may be of wood or concrete. In the middle of the floor, directly over the pit, a trap-door 3 x 5 feet is cut. Through this opening the cans of milk are lowered to the ice. This trap-door is not hinged, but simply forms the bottom of a shallow box, which may be lowered into the pit by means of a rope and pulley and allowed to rest on the ice. This tends to keep the pit more sanitary than where cans of milk or cream, which may have a certain amount of dirt on the bottoms, are set directly on the ice.

The ice-room provides accommodation for storing a considerable quantity of perishable foodstuffs, such as meat, butter, eggs, and vegetables, on the shelves and the floor.

BILL OF MATERIAL, ICE AND MILK HOUSE No. 2.

Framing Lumber.

No. of Pcs.	Thick. In.	Wide. In.	Long. Ft.	Feet Board Measure.	Used for.
2	4	6	12	48	Sills to end walls.
2	4	6	20	80	Sills to side walls.
1	4	6	14	28	Sills under centre of floor-joists, to cut 1 piece 3' and 1 piece 11'.
4	2	12	8	64	Plank floor to platform.
1	2	12	4	8	Step to platform.
12	2	6	12	144	Joists.

BILL OF MATERIAL, ICE AND MILK HOUSE No. 2—Continued.

Framing Lumber—Concluded.

No. of Pcs.	Thick.	Wide.	Long.	Feet Board Measure.	Used for.
3	2	6	10	30	Joists to both sides of ice-pit, to cut 6 pieces 5'.
2	2	6	12	24	Ridge.
1	2	6	10	10	Trimming to ice-pit opening, to cut 2 pieces 5'.
8	2	6	8	64	Cedar ledges nailed at top and bottom of ice-pit boarding.
32	2	6	14	448	Cedar plank fixed upright as sides to ice-pit, to cut 64 pieces 7'.
26	2	4	8	139	Studs to side walls.
6	2	4	10	40	Studs to end and division walls.
6	2	4	12	48	Studs at all door openings.
3	2	4	14	28	Extra studs to door openings, to cut 6 pieces 6' 8".
2	2	4	16	21	Studs over doors and for window trimming.
26	2	4	8	139	Rafters.
10	2	4	6	40	Collar-ties.
1	2	4	8	5	Back bearer under table-top.
1	2	4	12	8	Legs and cross-bearer to table.
1	2	4	10	7	Cross-bearers under shelves.
1	2	4	8	5	Cross-bearers under shelves.
1	2	4	12	8	Joists and bearers for loading-platform.
1	2	4	10	7	Joists and bearers for loading-platform.
1	2	4	8	5	Joists and bearers for loading-platform.
8	2	4	12	64	Roof-plates.
Total framing lumber				1,512	

Finish Lumber.

3	2	12	8	48	Table-top.
1	2	8	12	16	Door and window sills.
2	1	12	12	24	Top shelving.
4	1	10	12	40	Lower shelving.
1	1	8	10	7	Lining to ice-pit trap.
1	1	8	6	4	Lining to ice-pit trap.
3	1	7	14	25	Door-frames.
1	1	7	10	6	Door-frames.
2	1	6	12	12	Ridge cover-boards.
4	1	6	10	20	Corner-boards.
1	1	6	12	6	Louvres to ventilators.
1	1	6	10	5	Window-frame.
4	1	6	8	16	Frieze to gable ends.
4	1	6	10	20	Frieze to sides.

BILL OF MATERIAL, ICE AND MILK HOUSE No. 2—*Concluded.**Finish Lumber*—Concluded.

No. of Pcs.	Thick. In.	Wide. In.	Long. Ft.	Feet Board Measure.	Used for.
3	1	6	12	18	Battens and braces to doors.
2	1	5	12	10	Ridge cover-boards.
4	1	5	10	17	Corner-boards.
2	1	5	14	12	Door-casing.
1	1	5	8	3	Door-casing.
1	1	4	10	3	Window-casing.
3	1	2	14	7	Door-stops.
2	1	2	10	3	Window and door stops.
Total finish lumber			322		

Short lengths (i.e., under 10 feet) cost less than long, and where they will answer the purpose it pays to specify them. For example, it is cheaper to buy 6- and 8-foot lengths than to cut them out of 12- and 16-foot lengths.

2,200 feet, board measure, 1" shiplap for outside walls, roof, and lining the interior.

700 feet, board measure, drop-siding.

80 feet, board measure, 1" V-joint for doors.

300 feet, board measure, 1" T. and G. flooring, Fir or Larch.

3,500 British Columbia Red Cedar shingles (14 bundles).

4 rolls of tar-paper.

240 bushels of sawdust for filling in walls and bottom of ice-pit.

1 4-light sash, 12" x 18"; outside measurement 2' 4½" wide by 3' 5" high.

1 4-light sash, 10" x 14"; outside measurement 2' 0½" wide by 2' 9" high for outside door to ice-room.

Hardware.

60 lb. 2½" common nails.

35 lb. 4" common nails.

15 lb. 2½" flooring-nails.

20 lb. 1¼" shingle-nails, zinc-clad, best-quality galvanized, or cut iron.

5 lb. 2" finish-nails.

3 pairs 8" T-hinges.

1 pair 5" T-hinges.

3 door-latches.

1 window fastening.

2 12" lengths small chain for window when open.

2 pieces insect-netting, 12 x 24.

1 piece insect-screen, 2' 6" x 3' 7", for window.

Combination Can and Pail Rack.

Fig. 20 shows a combination can and pail rack to be used outside the milk-room. The cans and pails are held in an inverted position so as to drain thoroughly, and also to get plenty of sunshine and fresh air

on all parts. The cans are kept in position simply by their own weight, while the light railing on either side of the pails prevents them from being blown down by the wind. This device is one of the simplest and most satisfactory methods of airing dairy utensils.

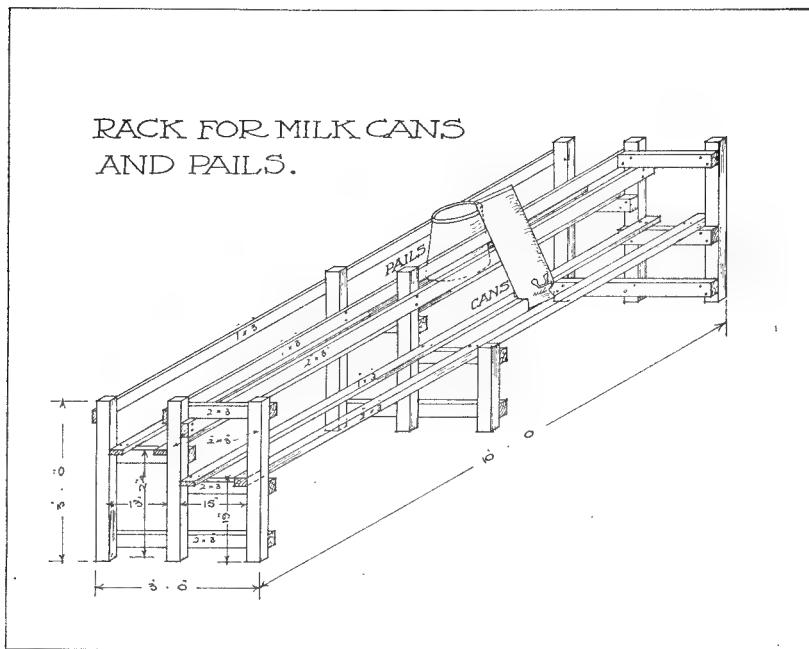


Fig. 20. This helps to keep the dairy utensils clean and sweet.

BILL OF MATERIAL, COMBINATION RACK FOR MILK CANS AND PAULS.

8 pieces 2" x 3" x 3' for uprights at ends and centre.
 3 pieces 2" x 3" x 3' for cross-rails at bottoms of uprights.
 3 pieces 2" x 3" x 10', to cut 5 bearers 21" long, 3 bearers 19" long, and
 1 upright 21" long.
 5 pieces 1" x 3" x 10' for rails and shelf-slats.
 2 pieces 2" x 3" x 10' for rails and shelf-slats.
 2 lb. 3½" common nails.
 1 lb. 2½" common nails.

BRITISH COLUMBIA DEPARTMENT OF LANDS.

FOREST SERVICE.

HON. WILLIAM R. ROSS, K.C., Minister of Lands.

Wood as a Building Material.

Wood is supreme for **all-round usefulness**.

It is the **cheapest** building material obtainable.

It is also the **lightest**.

It is the **strongest**, weight for weight.

It is the **easiest** to work; **any one** can use it.

A wooden building is by far the **simplest** to erect.

Wood is **attractive** in appearance and has great variety and beauty for interior finish.

Unlike metal and masonry, wood is almost a **non-conductor** of **heat** and **cold**.

A building with wooden walls and a wooden shingle roof is **warm** in winter and **cool** in summer and **dry** all the time.

Wood is therefore particularly **suitable** for **houses** and **barns**.

Wood is very **durable** in all kinds of building work **above ground**.

It will give **generations** of service, especially if well painted where exposed to the weather.

For use in **contact** with the **soil**, as mud-sills or fence-posts, a preservative should be applied or a specially resistant wood such as Western Red Cedar should be used.

Woods to Use.

Grown in British Columbia--Manufactured in British Columbia.

Woods differ in their qualities of strength, hardness, and durability. Certain kinds are particularly suited for certain uses. It is important to use the right wood in the right place.

(1.) **General Building Work.**—Douglas Fir, Western Larch, Western Hemlock, Mountain Western Pine, Mountain and Coast Spruce, Western White Pine.

(2.) **Framing and Dimension Timber, Posts, Beams, Rafters, Studs, Sills, Plates, Joists.**—Light construction: Same as No. 1. Heavy construction: Douglas Fir, Western Larch, Western Hemlock.

(3.) **Rough Lumber or Sheathing not exposed to Weather (Inside Work or covered by Siding or Lath and Plaster).**—Any British Columbia wood.

(4.) **Rough Outside Sheathing exposed to Weather (Outbuildings, etc.).**—Douglas Fir, Western Larch, Mountain Western Pine, Western Red Cedar, Coast and Mountain Spruce, Western White Pine.

(5.) **Siding.**—Western Red Cedar, Douglas Fir, Mountain Western Pine, Mountain and Coast Spruce.

(6.) **Roofing.**—Western Red Cedar edge-grain shingles, with galvanized, zinc-clad, zinc, or copper nails.

(7.) **Flooring, Stair Stepping, Sidewalks.**—Douglas Fir, Western Larch, Western Hemlock. Use edge-grain stock for hardest wear.

(8.) **Interior Finish, Panelling, Trim.**—Douglas Fir, solid or veneer (a beautiful grain, superior to most hardwoods), Western Larch, Mountain Western Pine, Western White Pine.

(9.) **Doors, Window-sash.**—Douglas Fir, Western Red Cedar, Western Larch, Mountain Western Pine, Western White Pine.

(10.) **Fence Pickets.**—Douglas Fir, Western Larch, Western Red Cedar, Mountain Western Pine.

- (11.) **Piling, Cribbing.**—Douglas Fir, Western Larch.
- (12.) **Silos, Tanks.**—Douglas Fir, Western Larch, Western Red Cedar.
- (13.) **Ground-sills, Skids, Fence-posts, Poles, Conduits, Drains, and wherever Wood is in Contact with the Ground.**—Western Red Cedar or creosoted wood. Use Douglas Fir or Western Larch where strength and hardness are essential.
- (14.) **Furniture, Tables, Settees, etc.**—Douglas Fir, Mountain Western Pine, Coast or Mountain Spruce, Western White Pine, Western Red Cedar.

NOTE.—Western Hemlock is superior in every way to Eastern Hemlock—an entirely different tree—and should not be confused with it.

BRITISH COLUMBIA FOREST SERVICE BULLETINS.

Farm Buildings Series.

1. Combination or General Purpose Barns for Prairie Farms.
2. Dairy Barns, Milk and Ice Houses for Prairie Farms.
3. Beef Cattle Barns for Prairie Farms.
4. Horse Barns for Prairie Farms.
5. Sheep Barns for Prairie Farms.
6. Piggeries and Smokehouse for Prairie Farms.
7. Poultry Houses for Prairie Farms.
8. Implement Sheds and Granaries for Prairie Farms.
9. Silos and Root Cellar for Prairie Farms.
10. Farm Houses for Prairie Farms.

Timber Series.

11. British Columbia Box Woods.
12. How to finish British Columbia Woods.
13. British Columbia Tie Timber.
14. British Columbia Dimension Timber.

The above bulletins, and also further information concerning British Columbia timber, are obtainable **free** from the Chief Forester, Victoria, B.C. Of the Timber Series, Bulletin No. 12, "How to Finish British Columbia Woods," is of special interest to home builders and owners, carpenters, architects, and building contractors.

OTHER PUBLICATIONS.

Many publications and much useful information on farming and related subjects can be obtained on request from the various Government Public Service organizations of Canada, listed below.

(1.) **Alberta:**

Department of Agriculture, Edmonton.
University of Alberta, Edmonton.
Agricultural Schools at Olds, Vermilion, and Lethbridge.
Dominion Experimental Stations at Lethbridge, Lacombe, and Fort Vermilion.

(2.) **British Columbia:**

Department of Agriculture, Victoria, B.C.
Dominion Experimental Farm, Agassiz, and Experimental Stations at Sidney, Salmon Arm, Summerland, and Invermere.

(3.) **Dominion:**

Department of Agriculture, Ottawa, Ont.
Dominion Forestry Branch, Ottawa, Ont.

(4.) **Manitoba:**

Department of Agriculture, Winnipeg.
Manitoba Agricultural College, Winnipeg.
Dominion Experimental Farm, Brandon, and Experimental Station at Morden.

(5.) **Saskatchewan:**

Department of Agriculture, Regina.
University of Saskatchewan, Saskatoon.
Dominion Experimental Farm, Indian Head; Forestry Station, Indian Head; and Experimental Stations at Scott and Rosthern.

BRITISH COLUMBIA

Four Hundred Billion Feet of Timber

READY FOR USE

Half Canada's Supply

Over Four Hundred Mills Manufacturing
Fifteen Hundred Million Feet
a Year into

Dimension Material, Boards, Shingles, Siding, Interior Finish,
Flooring, Ceiling, Sash and Doors, Lath, Boxes,
Cooperage, Wooden Pipes, Tanks and Silos,
Pulp and Paper, Bridge Timbers, Mine
Props, Elevator Cribbing, Tele-
phone Poles, Piling, Railway
Ties, Fence Posts, Pickets,
Paving Blocks,
Furniture,
and numerous other products.

B.C. Lumber

FOR THE

PRAIRIE FARM

QUANTITY

The Province contains over 400,000,000,000 feet board measure, or over half the standing timber of Canada. There is plenty of it.

QUALITY

The forests of British Columbia grow the best timber it is possible to obtain.

USEFULNESS

The timber trees of British Columbia supply the

Most Useful of All Woods,
particularly for building work, because of their lightness, strength, and ease of working.

British Columbia Timber
is "made in Canada"

The lumber industry engaged in its manufacture is one of the best markets for the products of the farms of Western Canada. It is sound sentiment and sound business for Canadian farmers to buy

B.C. LUMBER